

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE
REGION 1

**Environmental Contaminants Program
On-Refuge Investigations Sub-Activity**

**PESTICIDE IMPACT ASSESSMENT IN TULE LAKE AND LOWER
KLAMATH NATIONAL WILDLIFE REFUGES,
April 10, 2000 through September 29, 2000**

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by

Tony Hawkes
Environmental Contaminants Specialist

Edward Merrall
Biological Science Technician

Deborah Giovanis
Biological Science Technician

for

Phil Norton, Refuge Manager
Klamath Basin Refuges
Route 1, Box 74
Tulelake, CA 96134

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I. INTRODUCTION

I. A. Study Area

Tule Lake and the adjacent Lower Klamath National Wildlife Refuges (TLNWR and LKNWR) serve as key spring/fall staging and overwintering areas for Pacific Flyway migratory waterfowl, with more than 89 million goose and duck use days recorded in the refuges in 1988. As many as 1000 bald eagles (the greatest concentration in the lower 48 states) also overwinter in the Klamath Basin, utilizing these refuges for food resources. The shortnose suckers (*Chasmistes brevirostris*) and the Lost River suckers (*Deltistes luxatus*), listed as endangered in 1988, inhabit Tule Lake (in TLNWR), habitat that is currently proposed critical habitat for the suckers.

The refuges are located in northern California and southern Oregon in a region of intensive agriculture. Lands on the refuges are leased to growers under requirements of the Kuchel Act, which provides for leasing of up to 22,000 acres. Crops currently grown include potatoes, onions, sugarbeets, alfalfa, and grains. More than 45 different pesticides are allowed on the lease lands, including some extremely toxic insecticides, such as the organophosphates, disulfoton and chlorpyrifos, and pyrethroids, such as permethrin and cyfluthrin. These pesticides have been allowed by Region 1's Pesticide Use Proposal (PUP) Committee under a series of strict application methods, weather restrictions, and buffer zones.

I. B. Related Research

Early studies, before the institution of these restrictions on pesticide use through the PUP process, revealed a variety of ecosystem-wide impacts on TLNWR. For example, Boyer (1993), using TLNWR drainwater and FETAX bioassays with the African frog, demonstrated numerous deformities in amphibians. Boyer also found few frogs of any species on the refuge. Littleton (1993) showed a wide variety of deformities, high rates of parasitism, and extremely low fish diversity in refuge aquatic systems. She also noted a fish kill after application of acrolein to one canal. Similarly, *in situ* bioassays with invertebrates (*Daphnia*, *hyalella*) during the growing season disclosed very low rates of survival, often less than 20 percent, in many drainwaters (Bennett 1994). Studies of terrestrial birds have also revealed some bird mortalities (various National Wildlife Health Laboratory Mortality Reports). Sixty-eight percent (28 of 41) adult pheasants (*Phasianus colchicus*) in and near potato fields sprayed with organophosphate pesticides at TLNWR during 1990 - 1992 showed brain AChE inhibition of 19-62% (Grove 1995). Similarly, 62 percent (33 of 53) of juvenile Savannah sparrows (*Passerculus sandwichensis*) had AChE inhibition of 21-92% (Grove 1995).

Since the institution of PUPs on the refuge in 1994, systematic surveys or spot checks have only recently been conducted (1998-2000 field seasons) by the refuge or by this office, to determine PUP compliance, or to assess bird and fish impacts following pesticide spraying. However, three cases of pesticide uses not approved by on the PUP committee were documented in 1997. Two fish kills were also documented during

pesticide monitoring. In 1998, a fish kill of more than 2000 fish, possibly from the pesticide acrolein, occurred in the Lost River, which supplies water to both TLNWR and LKNWR. Another fish kill of more than 100 Lost River (*Deltistes luxatus*) and shortnose (*Chasmistes brevirostris*) suckers occurred on the Lost River during the 1999 field season. Recent application of the pesticide acrolein was suspected in this kill as well. The sampling required to adequately investigate these incidents and identify agriculture related pesticide involvement, exceeded Region 1's emergency contaminant budget.

I. C. Pesticide Impact Monitoring Study, 2000

The 2000 field season was the third and final year of the Pesticide Impact Monitoring Study at TLNWR and LKNWR. The objectives of this study were (1) to survey both refuges for dead or impaired wildlife, (2) to determine whether pesticide exposure is implicated in any death or impairment discovered, and (3) to investigate the source of any pesticide exposure detected.

During the 2000 field season, study monitors had collateral responsibilities on a separate pesticide impact investigation at TLNWR. The objective was 1) to determine the presence of juvenile Lost River Sucker and the Shortnose Sucker in the marsh and 2) to determine environmental impacts resulting from an application of Rodeo® (glyphosate) used to control an invasive aquatic plant, purple loosestrife (*Lythrum salicaria*). Study monitors conducted cast net sampling before and after herbicide applications to monitor application associated changes in sucker abundance. These activities and findings will be covered under a separate report.

II. METHODS

II. A. Surveys

Wildlife impacts from pesticide use were monitored primarily through observational surveys. Each location surveyed was searched for evidence of impacts. Only wildlife that were injured, deceased, or of special interest to the project, i.e. endangered species, were recorded and/or collected. Locations were chosen, depending on survey type, either at random or in response to information about recent pesticide use or exposure in the area. Surveys were of five general types: (1) Field surveys, (2) Aquatic surveys, (3) Driving surveys, (4) Response surveys, and (5) In Route surveys.

Field Surveys

For the purposes of this study, a field is defined as a single lease lot. Plantings that ran over lot boundaries were considered separate fields. All field surveys were conducted on foot at a pace of 30 meters per minute. Field surveys were either conducted within the perimeter of the field (in-field survey) or on the immediate border of the field (field perimeter survey).

In-field surveys were conducted by walking transects through fields with visual coverage

of approximately 6 meters from either side of the transect. The number of transects performed per field depended on the width of the single crop planting, the majority of which were onions. An average of four transects were performed per field, incorporating binocular surveys into each transect walked. Binocular surveys consisted of a visual assessment of the field from three points on the transect, the beginning, center and end points. The objective of infield surveys was to visually inspect 75% of the field area. However, six of 31 Lorsban treated onion fields were surveyed with a visual coverage of approximately 100%.

Perimeter surveys were conducted following applications of specific pesticides, before permissible reentry periods would allow in-field surveys, in specific crops where restricted use pesticides were used, or when in-field surveys became impractical due to crop height and density or due to potential damage to crop. Perimeter surveys were conducted by walking the entire perimeter of the field and visually inspecting ~3 meters infield and 6 meters outfield for evidence of pesticide use impacts to wildlife. Surveys identified as buffer zone surveys were perimeter surveys conducted within a buffer zone. A buffer zone is an area where pesticide application is prohibited to prevent possible contamination of an adjacent waterway.

Aquatic Surveys

For the purposes of this study, an aquatic survey is defined as a survey associated with a particular body of water rather than with a specific field. Aquatic surveys were conducted throughout the agricultural season with efforts intensified following applications of interest or mortality events. All aquatic surveys were conducted on foot at a pace of 30 meters per minute. Each aquatic survey was comprised of two aspects, a survey of the chosen water body and a survey of the adjacent area within 10 meters of the water body. Waterway surveys were conducted by walking the bank of a chosen body of water, scanning the water for evidence of impacts. Adjacent areas were then surveyed by walking the bank of the chosen body of water, scanning the vegetation within 6 meters of the water for evidence of impacts.

Driving Surveys

Driving surveys were conducted throughout the agricultural period, both in transit to other field survey locations and in response to observed and reported aerial spray or other agricultural activities. Driving surveys were not associated with any particular location and were not conducted over specific distances or for set lengths of time. All driving surveys were conducted from a vehicle moving at an average rate of 10 mph. Driving surveys were conducted by driving observer selected path within refuge boundaries, and scanning as much of the passing scenery as could be seen for evidence of impacts. Only pesticide spills (spill finds) or dead or impaired wildlife (casualty finds) were recorded during these surveys.

Response Surveys

Response surveys were those surveys conducted in response to a pesticide spill incident or to dead or impaired wildlife finds reported by sources outside the study. Conduct of the response surveys depended on what was reported but generally involved walking concentric circles extending around a reported wildlife mortality or spill and visually expecting the area for dead or impaired wildlife or cause of death. Spill finds or casualty finds were recorded in Field Notebooks and on Affected Wildlife Survey Data Forms.

II. B. Find Documentation and Sampling

A record was made of any evidence of possible pesticide impact found during surveys, and when feasible, samples were taken for further analysis. At a minimum, a written record was made of each find. Additional documentation could then include digital photographs, GPS coordinates, and water quality profiles.

When sample collection was feasible, samples were collected via the most appropriate of the following methods:

Terrestrial Vertebrate Sampling

Terrestrial vertebrates, whether collected from land or water, were first examined for evidence of injury or disease by a nitrile-gloved technician. Each individual would then be weighed wet on an electronic 2000g scale, measured with a meter tape, and given a descriptive leg tag. The individual would then be placed in a plastic bag to be sealed with chain-of-custody or evidence tape, and descriptive information would be placed on the bag's exterior. Next, the sample was placed into a second plastic bag and sealed to prevent future contamination. The so processed specimen would then be immediately chilled to await either long-term storage or shipment to an analytical facility.

Aquatic Vertebrate Sampling

Aquatic vertebrates were collected using the same method as for terrestrial vertebrates, with one important exception. Each individual would be wrapped in aluminum foil before being placed in a plastic bag due to concern of sample contamination by plastics. On occasion, however, an aquatic vertebrate would be small enough to be placed directly into a pre-cleaned glass jar in which case it would not be wrapped with aluminum foil. If the sample was too small for individual testing it might be lumped into a glass jar with other individuals to form a single, larger sample.

Water Sampling

Ideally, water samples would be collected for pesticide analysis in the event of a casualty find on water. However, no water samples were collected during the 2000

field season despite the occurrence of a fish kill and the recovery of several bird carcasses from refuge waterways.

Additional Sampling

On one occasion, eleven vegetation samples (~40 g each) were collected for pesticide residue analysis to evaluate compliance with buffer zone requirements and to determine if a drift might have been responsible for a wildlife mortality incident (Appendix C).

II. C. Hydrolabs

Whenever possible following discovery of a fish die-off, a hydrolab (Hydrolab Corp., Austin, TX) would be deployed for on-site analysis of water quality. Hydrolabs are self-contained water quality measurement and recording devices that monitor temperature, pH, conductivity, and dissolved oxygen of water at pre-set intervals. A typical hydrolab deployment during this study would be at a depth of three feet below the water's surface and last a minimum of two days and nights. Hydrolab data would be downloaded after the unit was recovered and reviewed for lethal water quality values.

II. D. Testing Facilities

Samples collected were typically sent for analysis to the most appropriate of the following testing facilities:

National Fish and Wildlife Forensic Laboratory, Ashland, OR. Analysis of terrestrial vertebrate specimens for cause of death and cholinesterase analyses.

California Animal Health and Food Safety Lab (CAHFS) Davis, CA
University of California, Davis – Pesticide residue analysis, brain cholinesterase and other standard biochemical analyses.

Patuxent Wildlife Research Center, Laurel, MD. Analysis of samples for presence of pesticides and cholinesterase analysis.

III. RESULTS

III. A. Overview

Detailed results of the Pesticide Impact Monitoring study are presented as a series of

Tables and Figures in Appendix A.

Four morbidity and 14 Mortality incidents were recorded during the study. No documented fish/wildlife mortality or morbidity event this season was determined to be causally linked to pesticide exposure as the primary cause of death. However, all testing facility analysis of samples has not been completed as of the writing of this report. Of those vertebrate specimens for which analysis has been completed, none showed evidence of adverse pesticide exposure.

The current year was marked by two significant mortality events. The first event was a fish kill at the R-canal extension involving the death of both Lost River suckers and Shortnose Suckers. Investigation revealed that the improper installation of a fish screen on the R-canal/English channel delivery structure permitted the fish to penetrate into an area of the canal where DO levels are generally not conducive to fish survival. Due to water levels the fish were unable to return to Tule Lake Sump 1-A. The graph of the hydrolab water quality monitoring data from that deployment is attached to this report (Figure 1a). DO concentrations known to cause lethality to fish (< 2 mg/L) were recorded (Table 10). Dissolved oxygen concentrations may have been even lower during the fish kill. The fish died between April 27 and May 4, 2000. The hydrolab was not deployed until May 5, 2000.

The second incident involved a black crowned night heron fatality that was in immediate spatial (canal adjacent to treated field) and temporal proximity (discovered ~ 28 hrs after application) to a Disyston 8 (disulfoton) application on leased lot TLL 352-8321. However, necropsy results suggest the cause of death was starvation due to abdominal parasites (Appendix B). No evidence of exposure to disulfoton was found based on brain cholinesterase and tissue residue analysis. Additionally, disulfoton residues were not detected in the buffer zone vegetation samples suggesting that a drift event to the adjacent canal where the casualty was found did not occur. However, investigation into this incident revealed failed compliance with specified pesticide application procedures (Appendix C).

According to study monitors, the most significant pesticide impact issue encountered was the net effect of poor compliance oversight by Siskiyou County Agricultural Department (SCAD) personnel. Evidence gathered from the leased lands indicates that certain activities that may pose risk to human health and the environment were routinely overlooked. For example:

- California Department of Pesticide Regulations requires fields treated with Restricted Use Pesticides to be posted every 600 ft. along public rights-of-way. Although refuge roads may not meet the definition of a public right-of-way, they do allow public access. Typically, these roads were posted only at the major compass point corners.
- Further evidence was documented demonstrating inaccurate application times on field postings, potentially placing PIM personnel in imminent danger while executing their assigned duties.
- Notice of Intent to apply restricted use compounds were not always forwarded to study monitors in a timely manner thus preventing efficient and effective application

- scrutiny by PIM personnel.
- Many row crop irrigation systems did not have shields on the row end sprinklers to prevent infiltration of chemigation agents onto the adjacent roadway.
- In addition to the compliance oversight deficiencies PIM personnel often encountered an adversarial demeanor when attempting to coordinate activities with SCAD personnel.

III. B. Pesticide Product – survey details

Of the products approved for use on the refuge, Lorsban, Vapam, and Disyston 8 received more scrutiny than other pesticides as they were perceived to pose the greatest risk to fish and wildlife. Survey details follow:

- a) 31 Lorsban (chlorpyrifos) treated onion fields were surveyed infield – 6 @ 100% visual coverage, 25 @ 75% visual coverage (Table 1 and 2).
- b) Vapam (metam-sodium) – 5 treated field perimeters surveyed (Table 1 and 3).
- b) Disyston 8 (disulfoton) - 23 treated barley field perimeters & waterways surveyed and one barley field buffer zone and perimeter surveyed (Table 1, 3, 4, and 5).

III. C. Agricultural Chemical Spills

No wildlife impacts were observed from the three agricultural related spills that were encountered during the 2000 field season. In one of the events a leak was detected at the junction of the supply line from a stock tank containing N-thuric fertilizer and the irrigation pipeline. The leak was substantial enough to wet an area of ~100 ft². A subsequent search of the area revealed no findings to suggest contamination of nearby surface water or impact to wildlife. Other similar leak events were observed in irrigation systems but were not documented because they were very small and chemical use could not be confirmed. It is relatively commonplace to observe irrigation sprinkler heads at row ends spraying into adjacent roadways. This has the potential to contaminate passersby and therefore should be addressed in some manner.

A small spill of granular fertilizer was found on one of the lease lots. The entire spill covered an area of about 5 ft² and included a relatively small number of dispersed white granules.

Possible contaminants present in a third small agricultural spill (approximately 10 ft²) that included small white granules (presumably fertilizer) and a bluish power (possibly from a seed treatment) were not verified. The spill area was flooded from irrigation before a sample could be obtained the following day.

III. D. Mortality and Morbidity

Mortality events are summarized in the Table below and in Appendix A, Table 9-10. Four morbidity observations were recorded. A white pelican (WHPE) and a western grebe (WEGR) were observed on the same day, exhibiting signs of lethargy, depression and unable/willing to flush when forced. PIM's returned the following day and discovered the pelican expired and no further sign of the WEGR. Analysis of cholinesterase inhibition is pending

During a Disyston post-application survey on TLL 390-8388 a double crested cormorant (DOCO) was observed in the N-15 canal adjacent to the treated field. It refused to flush when repeatedly forced and exhibited symptoms of difficulty breathing. The bird was not observed on subsequent follow-up surveys nor was a carcass recovered.

While in-route to a field survey, a juvenile Northern harrier (NOHA) was observed unable to take flight on lot C1-B. The bird was retrieved and subsequently examined by a veterinarian. It appeared to be grossly underweight/starving but no other significant findings were revealed during the exam. Veterinary recommendations included a course of vitamins and feeding live mice daily. The bird was retained for evidence purposes in the event that it expired. The bird responded to the treatment regimen and did not succumb. It was then turned over to a wildlife rehabilitator where it survived less than 24 hours. Cause of death is unknown but assumed to be starvation and stress related. Analysis of brain enzyme activity will be performed to evaluate possible exposure to cholinesterase inhibiting insecticides.

The number of carcasses found appear insignificant given search effort. The total number of carcasses found during the study was 27 (see table below). During 124 surveys (including infield, perimeter, aquatic, in-route, and driving surveys) pesticide monitors found a total of 7 carcasses (Table 9). The additional 20 carcasses were recovered by monitors responding to 9 reports by personnel not involved in the study (response surveys). Mortality events were noted on 15 separate occasions. The fish kill (n=13) was the only incident where more than one mortality was observed.

| Mortality Incidents | | | |
|---|-----------------------|---------------------------|---|
| Incident No | Number of Mortalities | Species | Comments |
| Infield: 2 mortalities/ 31 surveys | | | |
| 1 | 1 | Redwinged blackbird | Cause of death unknown, specimen not collected |
| 2 | ≥1 | Snow goose | Cause of death unknown, advanced state of decay |
| Aquatic: 2 mortalities/30 surveys | | | |
| 3 | 1 | Cinnamon teal | Carcass recovered. Evidence of predation. Analysis for pesticide exposure is pending |
| 4 | 1 | Black-crowned night heron | Cause of death starvation associated with nematode infestation. Tissue residue analysis and brain ChE do not indicate exposure to pesticides. |
| Perimeter: 0 mortalities/ 32 surveys | | | |
| In-route: 2 mortalities/3 surveys | | | |
| 5 | 1 | Vole sp. | Found on roadway. Evidence of predation. |
| 6 | 1 | Black-crowned night heron | Juvenile on roadway. Cause of death believed to be vehicle strike. Pesticide exposure analysis pending. |
| Driving: 1 mortality/10 surveys | | | |
| 7 | 1 | Great Egret | Evidence of predation. Carcass not collected due to advanced state of decay |
| Response: 20 mortalities/9 surveys | | | |
| 8 | 13 | Sucker spp. | Believed to be due to poor water quality (low dissolved oxygen). Pesticide exposure analysis pending. |
| 9 | 1 | Muskrat | Cause of death appears to be drowning, caught underwater on structure. Pesticide exposure analysis pending. |
| 10 | 1 | White Pelican | Found intact in Tule lake Sump 1-A. Pesticide exposure analysis pending. |
| 11 | 1 | Western Grebe | Found intact in Q-canal adjacent to lots. Pesticide exposure analysis pending. |
| 12 | 1 | White Pelican | Found intact in Tule lake Sump 1-A. Pesticide exposure analysis pending. |
| 13 | 1 | White Pelican | Found on road. Vehicle strike suspected cause of death. Pesticide exposure analysis pending. |
| 14 | 1 | White Pelican | Bird appeared impaired and unwilling to flush. The next day it was found dead on Sump 1-A. Pesticide exposure analysis pending. |
| 15 | 1 | Coyote | Found in Discovery Marsh. No visible external trauma. Necropsy suggests possible rodenticide poisoning. Sample not retained for further analysis. |

III. E. Hydrolabs

Hydrolabs were deployed twice during the 2000 season. The first deployment was in response to the May 5, 2000 R-canal fish kill. The second event was in conjunction with a Service herbicide application to purple loosestrife (*Lythrum salicaria*) in Tule Lake Sump 1-A. Deployment results are presented in Appendix A, Figures 1a & b.

IV. DISCUSSION

Though pesticide residue analysis is not complete, data available at this point do not confirm direct impact of pesticides to wildlife at TLNWR and LKNWR during the 2000 field season. Given search efforts, relatively few carcasses were found indicating that the occurrence of pesticide-related mortalities on the refuge might be low. One hundred nine standardized carcass searches including in-field (n=31), perimeter (n=49), and aquatic (n=29) surveys recovered a total of 5 carcasses on a total cumulative transect length of approximately 218 miles (~ 2 transect miles/survey). However, even if we assume the casualties found were pesticide induced, our ability to make quantitative extrapolations regarding pesticide impacts to wildlife is limited because methods were not employed to consider searcher efficiency, predator removal of carcasses, and wildlife use of treated fields.

The majority of carcasses recovered (19) were in response to report by non-study personnel. Although pesticides exposure has not been ruled out (analysis pending), field evidence suggests that other factors (vehicle strike, predation, etc.) may be the primary cause of death in many of these cases. The only mortality incident found that involved recovery of more than 1 carcass was a fish kill of 13 individuals. As previously discussed, it is believed that these fish died because a fish screen was improperly installed enabling them to enter a canal prone to episodes of low dissolved oxygen.

Three agricultural chemical spills were noted in 2000 (two fertilizer spills, and one fertilizer/seed treatment spill). This represents a reduction in number of spills found in 1998 (n=16) and 1999 (n=4). Though no wildlife impacts were demonstrated to have resulted from these spills, the potential for impact does exist. Seed treatments are a concern because they are attractive to birds. Spills of both fuel and agricultural chemicals associated with irrigation pump stations are also a potential hazard as these stations are located near irrigation canals that are used by fish and wildlife and drain into Tule Lake or the Klamath River. Considering the reductions in spill finds it appears that growers are being more attentive to measures to prevent spills.

On several instances, sampling efforts to evaluate potential involvement of pesticide exposure in mortality events could have been improved. Water samples were not collected for pesticide analysis in any instance even though mortality events were documented on waterways on at least 8 occasions during the study. Sampling was not always done immediately upon discovery of an incident potentially jeopardizing the

validity of the sample and in one case preventing collection of the sample. Buffer zone samples of vegetation were too small (~40 grams) given the “spotty” coverage that would be expected with spray drift (a much larger sample would be preferred, *e.g.* clip all vegetation in 1 ft² area). Finally, study monitors were not on duty during weekends. Monitors felt that many pesticide applications were scheduled during weekends to avoid observer scrutiny during and immediately after the application.

Finally, study monitors reported several infractions of California pesticide application requirements and suggest that Siskiyou County Agricultural Department personnel were deficient in their oversight of these activities. Some of the infractions noted (inadequate posting of areas treated with restricted use pesticides and chemigation spray onto refuge roadways with public access) pose a potential threat to human health. Concerns regarding these compliance issues should be communicated to the growers, applicators, and the Siskiyou County Agricultural Commissioner or other appropriate authorities.

V. REFERENCES

- Bennett, J. K.** 1994. Bioassessment of irrigation drainwater effects on the aquatic resources in the Klamath Basin of California and Oregon. Ph.D. Dissertation, University of Washington, Seattle, WA. 197 pp.
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- Grove, R. A.** 1995. Evaluation of current agricultural practices and organo-phosphorous insecticide use in relation to ring-necked pheasant numbers at Klamath Basin Refuges, California. M.S. Thesis. Oregon State University, Corvallis, OR. 184 pp.
- Littleton, T. M.** 1993. Water quality and fishes of the Lower Klamath and Tule Lake National Wildlife Refuges. M.S. Thesis, University of Washington, Seattle, WA. 53 pp.

Appendix A

Table 1. Tulalake NWR & Lower Klamath NWR Field Monitoring for Pesticide Impacts 2000 –Survey Data Sheets

Table 2. Results of All Infield Surveys

Table 3. Results of All Perimeter Surveys

Table 4. Results of All Aquatic Surveys

Table 5. Results of All Buffer Surveys

Table 6. Results of All In-Route Surveys

Table 7. Results of all Response Surveys

Table 8. Results of All Driving Surveys

Table 9. Summary of Results of All Surveys

Table 10. Hydrolab Water Quality Data- R Canal Fish Kill

Figure 1a. Hydrolab Water Quality Monitoring – R Canal Fish Kill

Figure 1b. Water Quality Monitoring for Purple Loosestrife Treatment.

| Table 1. Tule Lake NWR and Lower Klamath NWR Field Monitoring for Pesticide Impact 2000 – Survey Data Sheet | | | | | | | | |
|--|-------------------|-----------------------------|-------------|--------------------------------|----------------------|----------|------------------------------|--|
| Date | Survey ID# | Location^a | Crop | Survey Type^b | Affected Spp. | # | Condition^c | Comments |
| 04/28/2000 | TSUM1AD1 | TL, Sump 1-A | N/A | D | None | 0 | N/A | |
| 04/28/2000 | LKCOPTR1 | LK, Coyote Point | N/A | R | None | 0 | N/A | |
| 05/01/2000 | T231EP01 | TL, Lot 8251 | potato | P | None | 0 | N/A | |
| 05/01/2000 | T231EW01 | TL, Lot 8251 | N/A | A | None | 0 | N/A | |
| 05/02/2000 | T229EP01 | TL, Lot 8249 | potato | P | None | 0 | N/A | |
| 05/02/2000 | T230EP01 | TL, Lot 8251 | potato | P | None | 0 | N/A | |
| 05/02/2000 | T231WP01 | TL, Lot 8252 | potato | P | None | 0 | N/A | |
| 05/03/2000 | T228XR01 | TL, Lot 8247 | N/A | D | Vole sp. | 1 | D | In-route. While driving along the perimeter of 8247 we encountered one vole off the road. Specimen was collected for possible AChE submission. COD: predation. |
| 05/04/2000 | TRCANLR1 | TL, R-Canal at Eng. Channel | N/A | R | Sucker sp. | 13 | D | Response. Killed near the R-Canal, specimens collected by L. Bigoni and placed in the freezer. COD: unknown, but suspected to be due to human error (the fish screen for the new R-Canal wasn't put on correctly). |
| 05/04/2000 | T228XP01 | TL, Lot 8247 | potato | P | None | 0 | N/A | |
| 05/08/2000 | T202WI01 | TL, Lot 8203 | onion | I | None | 0 | N/A | |
| 05/09/2000 | T102A1W1 | TL, drain 102-A-1 | N/A | A | None | 0 | N/A | |
| 05/09/2000 | T202EI01 | TL, Lot 8204 | onion | I | None | 0 | N/A | |

| Table 1 (Continued). Tule Lake NWR and Lower Klamath NWR Field Monitoring for Pesticide Impact 2000 – Survey Data Sheet | | | | | | | | |
|--|-------------------|-----------------------------|-------------|--------------------------------|----------------------|----------|------------------------------|--|
| Date | Survey ID# | Location^a | Crop | Survey Type^b | Affected Spp. | # | Condition^c | Comments |
| 05/10/2000 | T222WI01 | TL, Lot 8243 | onion | I | None | 0 | N/A | |
| 05/10/2000 | TLDIMW01 | TL, Discovery Marsh | N/A | A | None | 0 | N/A | |
| 05/11/2000 | T223WI01 | TL, Lot 8241 | onion | I | None | 0 | N/A | |
| 05/12/2000 | TLDIMW02 | TL, Discovery Marsh | N/A | A | CITE | 1 | D | Bite marks in breast indicating predation, no other trauma. Approx. 1m away from nest, 8 eggs in nest, 7 of the 8 eggs are broken. |
| 05/15/2000 | T222WI02 | TL, Lot 8243 | onion | I | None | 0 | N/A | |
| 05/15/2000 | KSTRDR01 | LK, Straits Drain Rd Area K | N/A | D | GREG | 1 | D | Evidence of predation (exposed chest cavity). Specific cause of death unknown. Specimen not collected due to degree of decomposition |
| 05/16/2000 | TLDM5162 | TL, Discovery Marsh | N/A | D | None | 0 | D | |
| 05/16/2000 | TL516001 | TL, general roads | N/A | D | None | 0 | N/A | |
| 05/16/2000 | T223EI01 | TL, Lot 8240 | onion | I | None | 0 | N/A | |
| 05/17/2000 | T222EI01 | TL, Lot 8242 | onion | I | None | 0 | N/A | |
| 05/17/2000 | T223EI02 | TL, Lot 8240 | onion | I | None | 0 | N/A | |

| Table 1 (Continued). Tule Lake NWR and Lower Klamath NWR Field Monitoring for Pesticide Impact 2000 – Survey Data Sheet | | | | | | | | |
|--|-------------------|--|-------------|--------------------------------|----------------------|----------|------------------------------|--|
| Date | Survey ID# | Location^a | Crop | Survey Type^b | Affected Spp. | # | Condition^c | Comments |
| 05/18/2000 | TENGCHR1 | TL, near the English Channel & R-1 Canal | N/A | R | Muskrat | 1 | D | Animal was picked up in the English Channel. Specimen was taken and placed in the freezer for possible AChE testing. COD: appears animals was caught on structure and drowned. |
| 05/18/2000 | T359SI01 | TL, Lot 8333 | onion | I | RWBL | 1 | D | Found in waterway south of Field Lot 8333. Specimen photo documented, but find is only a single death. Cause of death is undetermined, specimen is not collected. |
| 05/18/2000 | T359NI01 | TL, Lot 8332 | onion | I | None | 0 | N/A | |
| 05/19/2000 | T214SP01 | TL, Lot 8270 | grains | P | None | 0 | N/A | |
| 05/19/2000 | T214SW01 | TL, Lot 8270 | grains | A | None | 0 | N/A | |
| 05/19/2000 | T102C201 | TL, drain 102-C-2 | N/A | A | None | 0 | N/A | |
| 05/19/2000 | T217XP01 | TL, Lot 8225,8226 | grains | P | None | 0 | N/A | |
| 05/22/2000 | T217WI01 | TL, Lot 8225 | onion | I | None | 0 | N/A | |
| 05/22/2000 | T203EI01 | TL, Lot 8206 | onion | I | None | 0 | N/A | |
| 05/22/2000 | T203WI01 | TL, Lot 8205 | onion | I | None | 0 | N/A | |
| 05/22/2000 | T210WI01 | TL, Lot 8218 | onion | I | None | 0 | N/A | |
| 05/22/2000 | T210EI01 | TL, Lot 8217 | onion | I | None | 0 | N/A | |
| 05/23/2000 | T206XI01 | TL, Lot 8268 | onion | I | None | 0 | N/A | |

| Table 1 (Continued). Tule Lake NWR and Lower Klamath NWR Field Monitoring for Pesticide Impact 2000 – Survey Data Sheet | | | | | | | | |
|--|-------------------|-----------------------------|-------------|--------------------------------|----------------------|----------|------------------------------|---|
| Date | Survey ID# | Location^a | Crop | Survey Type^b | Affected Spp. | # | Condition^c | Comments |
| 05/23/2000 | T212WI01 | TL, Lot 8214 | onion | I | None | 0 | N/A | |
| 05/23/2000 | T212EI01 | TL, Lot 8213 | onion | I | None | 0 | N/A | |
| 05/24/2000 | T346SI01 | TL, Lot 8312 | onion | I | SNGO | 1 | N/A | Goose feathers located in Field Lot 8312. Specimens are scattered and we are unable to determine the number of carcasses. Wings not collected due to advanced state of decay. |
| 05/24/2000 | T347NI01 | TL, Lot 8313 | onion | I | None | 0 | N/A | |
| 05/24/2000 | T347SI01 | TL, Lot 8314 | onion | I | None | 0 | N/A | |
| 05/26/2000 | T102DRA1 | TL, drain 102 | N/A | A | None | 0 | N/A | |
| 05/26/2000 | T102DA01 | TL, drain 102-D | N/A | A | None | 0 | N/A | |
| 05/26/2000 | T102C1A1 | TL, drain 102-C-1 | N/A | A | None | 0 | N/A | |
| 05/26/2000 | T212XP01 | TL, Lot 8214, 8213 | grains | P | None | 0 | N/A | |
| 05/26/2000 | T210XP01 | TL, Lot 8218, 8217 | grains | P | None | 0 | N/A | |
| 05/30/2000 | T102DA01 | TL, drain 102-D | N/A | A | None | 0 | N/A | |
| 05/30/2000 | T207XP01 | TL, Lot 8268 | grains | P | None | 0 | N/A | |
| 05/30/2000 | T102C2A1 | TL, drain 102-C-2 | N/A | A | None | 0 | N/A | |
| 05/31/2000 | T371XI01 | TL, Lot 8353, 8354 | onion | I | None | 0 | N/A | |
| 05/31/2000 | T368XI01 | TL, Lot 8348, 8398 | onion | I | None | 0 | N/A | |

| Table 1 (Continued). Tule Lake NWR and Lower Klamath NWR Field Monitoring for Pesticide Impact 2000 – Survey Data Sheet | | | | | | | | |
|--|-------------------|------------------------------|-------------|--------------------------------|----------------------|----------|------------------------------|--|
| Date | Survey ID# | Location^a | Crop | Survey Type^b | Affected Spp. | # | Condition^c | Comments |
| 06/01/2000 | T227SI01 | TL, Lot 8234 | onion | I | None | 0 | N/A | |
| 06/01/2000 | TSMP1AR1 | TL, Pump #11 | N/A | R | WHPE | 1 | D | Bird collected by biologists in airboat performing surveys for suckers. Bird was in the water, and once collected, dropped ashore approx. 100m south of Pump #11. D. Thompson then contacted the PIM Team for the retrieval of the specimen and Investigation of area. Specimen Collected for Necropsy. Appears moderately desiccated. |
| 06/01/2000 | T217EI01 | TL, Lot 8226 | onion | I | None | 0 | N/A | |
| 06/05/2000 | KSTDRED2 | LK, Straits Drain Rd, Area K | N/A | D | None | 0 | N/A | |
| 06/05/2000 | KSTDRWD2 | LK, Straits Drain Rd, Area K | N/A | D | None | 0 | N/A | |
| 06/06/2000 | T227NI01 | TL, Lot 8232 | onion | I | None | 0 | N/A | |
| 06/06/2000 | T363XI01 | TL, Lot 8338, 8339 | onion | I | None | 0 | N/A | |
| 06/06/2000 | T227CI01 | TL, Lot 8233 | onion | I | None | 0 | N/A | |
| 06/09/2000 | T364XP01 | TL, Lot 8340, 8341 | grains | P | None | 0 | N/A | |
| 06/12/2000 | T352XW01 | TL, Lot 8321 | grains | A | BCNH | 1 | D | Bird was found floating in the waterway. Position was recorded, no damage incurred to the body that is apparent. Specimen taken to office for necropsy . Cause of death determined to be parasite infestation. See appendix C |

| Table 1 (Continued). Tule Lake NWR and Lower Klamath NWR Field Monitoring for Pesticide Impact 2000 – Survey Data Sheet | | | | | | | | |
|--|-------------------|--|-------------|--------------------------------|----------------------|----------|------------------------------|---|
| Date | Survey ID# | Location^a | Crop | Survey Type^b | Affected Spp. | # | Condition^c | Comments |
| 06/13/2000 | T353XW02 | TL, Lot 8321 | N/A | A | None | 0 | N/A | Survey is to recheck area, the same route was followed as 06/12/2000, except survey was performed from external side of the waterway from the field |
| 06/15/2000 | TEWRXR01 | TL, East-West Rd on the Bridge over the Lost River | N/A | R | BCNH | 1 | D | Noted that bird was a BCNH juvenile after pickup. Kill is estimated at 4-6 hours prior to pickup. Wing is broken and internal trauma noted. Cause of death: vehicle strike. |
| 06/15/2000 | T355SP01 | TL, Lot 8326 | grains | P | None | 0 | N/A | |
| 06/19/2000 | T373XW01 | TL, Lot 8357, 8358 | grains | A | None | 0 | N/A | |
| 06/19/2000 | T344XW01 | TL, Lot 8308, 8309 | grains | A | None | 0 | N/A | |
| 06/20/2000 | T386XW01 | TL, Lot 8378, 8384 | grains | A | None | 0 | N/A | |
| 06/22/2000 | T101B5W1 | TL, drain 101-B-5 | grains | A | None | 0 | N/A | |
| 06/22/2000 | TN15BW01 | TL, canal N-15-B | grains | A | None | 0 | N/A | |
| 06/28/2000 | T101B5W2 | TL, drain 101-B-5 | grains | A | None | 0 | N/A | |
| 06/28/2000 | TN12AW01 | TL, canal N-12-A | grains | A | None | 0 | N/A | |
| 07/06/2000 | T102C1BW1 | TL, drain 102-C-1-B | grains | A | None | 0 | N/A | |

| Table 1 (Continued). Tule Lake NWR and Lower Klamath NWR Field Monitoring for Pesticide Impact 2000 – Survey Data Sheet | | | | | | | | |
|--|-------------------|---|-------------|--------------------------------|----------------------|----------|------------------------------|--|
| Date | Survey ID# | Location^a | Crop | Survey Type^b | Affected Spp. | # | Condition^c | Comments |
| 07/06/2000 | TR-1XW01 | TL canal R-1 | grains | A | None | 0 | N/A | |
| 07/07/2000 | T201XR01 | TL, Q-Canal next to 8202 | N/A | R | WEGR | 1 | D | Responding to a call to pick up an animal in the Q-Canal near 8202. No cause of death could be determined. No visible external impacts on the bird and carcass is relatively fresh (no decay to eyes). |
| 07/11/2000 | TSUM1AR1 | TL, Sump 1-A near the canoe trail entrance on the East side | N/A | R | WHPE | 1 | D | Responding to a call regarding a WHPE mortality in the canoe trails in Sump 1-A, near the entrance ramp on the East side. After specimen was acquired, no cause of death could be pinpointed.. |
| 07/12/2000 | T101B4D1 | TL, drain 101-B-4 | N/A | D | None | 0 | N/A | |
| 07/17/2000 | TSUM1AR2 | TL, Sump 1-A, near F&W B-6 | N/A | R | WHPE | 1 | D | Responding to a call from D. Thompson re: WHPE mortality off of the auto tour route near F&W B-6. COD: Autostrike. Specimen had external trauma to the body that is usually caused by vehicular strikes. |

| Table 1 (Continued). Tule Lake NWR and Lower Klamath NWR Field Monitoring for Pesticide Impact 2000 – Survey Data Sheet | | | | | | | | |
|--|-------------------|--|-------------|--------------------------------|----------------------|----------|------------------------------|---|
| Date | Survey ID# | Location^a | Crop | Survey Type^b | Affected Spp. | # | Condition^c | Comments |
| 07/18/2000 | TSMP1BR1 | TL, Sump 1-B, near joining of Sump 1-A | N/A | R | WHPE WEGR | 1 1 | I | No responses to intentional flush attempts by EJM. In Route from field to USFVHQ a WHPE was noticed acting strangely in Sump 1-B across from USFWS B2-M. Bird's throat patch appeared pale. Attempts to flush produced no response, lethargic behavior. Also encountered a WEGR in the same area. Note: There are scratches to its head and neck (possible predator attack). Bird refused to flush. Will re-observe tomorrow. |
| 07/19/2000 | TSUM1BR2 | TL, Sump 1-B, near joining of Sump 1-A | N/A | R | WHPE | 1 | D | Returning to the site where we observed a WHPE acting in an unusual manner the day before. On arrival, we located the pelican at the end of one of the pipes (on the Sump 1-A side) dead in the water. Specimen was collected for further investigation and for a necropsy. No sign of the WEGR at the site. |
| 07/20/2000 | T228XP02 | TL, Lot 8247 | N/A | P | None | 0 | N/A | |
| 07/20/2000 | TL-Sump3 | TL, Sump 3 driving roads | N/A | D | None | 0 | N/A | |
| 07/24/2000 | LK | LK, Straits Drain Road | N/A | D | None | 0 | N/A | |
| 07/26/2000 | T231EP01 | TL, Lot 8353 | grains | P | None | 0 | N/A | |
| 07/26/2000 | TQ3BXW01 | TL, canal Q-3-B | N/A | A | None | 0 | N/A | |
| 07/28/2000 | T390EW01 | TL, Lot 8388 | grains | A | None | 0 | N/A | |
| 07/28/2000 | T390EW02 | TL, Lot 8388 | grains | A | None | 0 | N/A | |

| Table 1 (Continued). Tule Lake NWR and Lower Klamath NWR Field Monitoring for Pesticide Impact 2000 – Survey Data Sheet | | | | | | | | |
|--|-------------------|-----------------------------|-------------|--------------------------------|----------------------|----------|------------------------------|--|
| Date | Survey ID# | Location^a | Crop | Survey Type^b | Affected Spp. | # | Condition^c | Comments |
| 07/30/2000 | T390EW03 | TL, Lot 8388 | grains | A | None | 0 | N/A | |
| 07/30/2000 | T390EW04 | TL, Lot 8388 | grains | A | None | 0 | N/A | |
| 07/31/2000 | T390EW05 | TL, Lot 8388 | grains | A | DOCO | 1 | I | Observed DOCO in N-15, swimming. Observation made at intersection of 390E and 390W. Intentional attempts to flush resulted in a diving response only. Bird did not appear able or willing to fly and either swam away or dove in response to flushing attempts. Noted difficulty in breathing (e.g. repeated choking episodes). No immediate action taken. Resurveyed that section of N-15 adjacent to the northern boundary of 390E after Disyston 8 application. |
| 07/31/2000 | T390EW06 | TL, Lot 8388 | grains | A | None | 0 | N/A | |
| 07/31/2000 | T390EB01 | TL, Lot 8388 | grains | P | None | 0 | N/A | Buffer Zone survey |
| 08/04/2000 | T223XP02 | TL, Lot 8241, 8240 | onion | P | None | 0 | N/A | |
| 08/07/2000 | T227XP02 | TL, Lot 8232, 8233, 8234 | onion | P | None | 0 | N/A | |
| 08/08/2000 | TAUTRD01 | TL, Auto Dr Road | N/A | D | None | 0 | N/A | |
| 08/08/2000 | T364XP02 | TL, Lot 8340, 8341 | potato | P | None | 0 | N/A | |
| 08/08/2000 | T363XP01 | TL, Lot 8338, 8339 | potato | P | None | 0 | N/A | |
| 08/09/2000 | T377NP01 | TL, Lot 8365 | onion | P | None | 0 | N/A | |
| 08/09/2000 | T343XP01 | TL, Lot 8307 | grains | P | None | 0 | N/A | |

| Table 1 (Continued). Tule Lake NWR and Lower Klamath NWR Field Monitoring for Pesticide Impact 2000 – Survey Data Sheet | | | | | | | | |
|--|-------------------|-----------------------------|-------------|--------------------------------|----------------------|----------|------------------------------|--|
| Date | Survey ID# | Location^a | Crop | Survey Type^b | Affected Spp. | # | Condition^c | Comments |
| 08/10/2000 | T378XP01 | TL, Lot 8367, 8368 | potato | P | None | 0 | N/A | |
| 08/10/2000 | T379XP01 | TL, Lot 8369, 8370 | potato | P | None | 0 | N/A | |
| 08/10/2000 | T371XP01 | TL, Lot 8353, 8354 | onion | P | None | 0 | N/A | |
| 08/13/2000 | T348XP01 | TL, Lot 8315 | potato | P | None | 0 | N/A | |
| 08/13/2000 | T349XP01 | TL, Lot 8316, 8317 | potato | P | None | 0 | N/A | |
| 08/14/2000 | T344XP01 | TL, Lot 8308, 8309 | potato | P | None | 0 | N/A | |
| 08/14/2000 | T345XP01 | TL, Lot 8310, 8311 | potato | P | None | 0 | N/A | |
| 08/15/2000 | T203XP01 | TL, Lot 8205, 8206 | onion | P | None | 0 | N/A | |
| 08/15/2000 | T205WP01 | TL, Lot 8209, 8210 | potato | P | None | 0 | N/A | |
| 08/18/2000 | T347XP01 | TL, Lot 8313, 8314 | onion | P | None | 0 | N/A | |
| 08/18/2000 | T346XP01 | TL, Lot 8312 | onion | P | None | 0 | N/A | |
| 09/08/2000 | not collected | Lot C1-B | N/A | D | NOHA | 1 | I | In-route: Unable to fly, grossly underweight (exposed keel). Individual delivered to animal rehabilitator. Died on 09/15/2000. Cause of death likely starvation/stress. Specimen retrieved for possible cholinesterase analysis. |
| 09/13/2000 | not collected | Discovery Marsh | N/A | R | Coyote | 1 | D | Response to coyote dead in discovery marsh. No external signs of trauma. Necropsy indicate possible rodenticide poisoning. Specimen not retained for further analysis. |

| Table 2. Results of all Infield Surveys Conducted by Pesticide Impact Monitors on TLNWR and LKNWR – May 2000 through September 2000 | | | | | | | |
|--|-------------------|-----------------------------|-------------|----------------------|----------|------------------------------|---|
| Date | Survey ID# | Location^a | Crop | Affected Spp. | # | Condition^c | Comments |
| 05/08/2000 | T202WI01 | TL, Lot 8203 | onion | None | 0 | N/A | |
| 05/09/2000 | T202EI01 | TL, Lot 8204 | onion | None | 0 | N/A | |
| 05/10/2000 | T222WI01 | TL, Lot 8243 | onion | None | 0 | N/A | |
| 05/11/2000 | T223WI01 | TL, Lot 8241 | onion | None | 0 | N/A | |
| 05/15/2000 | T222WI02 | TL, Lot 8243 | onion | None | 0 | N/A | |
| 05/16/2000 | T223EI01 | TL, Lot 8240 | onion | None | 0 | N/A | |
| 05/17/2000 | T222EI01 | TL, Lot 8242 | onion | None | 0 | N/A | |
| 05/17/2000 | T223EI02 | TL, Lot 8240 | onion | None | 0 | N/A | |
| 05/18/2000 | T359SI01 | TL, Lot 8333 | onion | RWBL | 1 | D | Found in waterway south of Field Lot 8333. Specimen photo documented, but find is only a single death. Cause of death is undetermined, specimen is not collected. |
| 05/18/2000 | T359NI01 | TL, Lot 8332 | onion | None | 0 | N/A | |
| 05/22/2000 | T217WI01 | TL, Lot 8225 | onion | None | 0 | N/A | |
| 05/22/2000 | T203EI01 | TL, Lot 8206 | onion | None | 0 | N/A | |
| 05/22/2000 | T203WI01 | TL, Lot 8205 | onion | None | 0 | N/A | |
| 05/22/2000 | T210WI01 | TL, Lot 8218 | onion | None | 0 | N/A | |

| Table 2 (Continued). Results of all Infield Surveys Conducted by Pesticide Impact Monitors on TLNWR and LKNWR – May 2000 through September 2000 | | | | | | | |
|--|-------------------|-----------------------------|-------------|----------------------|----------|------------------------------|---|
| Date | Survey ID# | Location^a | Crop | Affected Spp. | # | Condition^c | Comments |
| 05/22/2000 | T210EI01 | TL, Lot 8217 | onion | None | 0 | N/A | |
| 05/23/2000 | T206XI01 | TL, Lot 8268 | onion | None | 0 | N/A | |
| 05/23/2000 | T212WI01 | TL, Lot 8214 | onion | None | 0 | N/A | |
| 05/23/2000 | T212EI01 | TL, Lot 8213 | onion | None | 0 | N/A | |
| 05/24/2000 | T346SI01 | TL, Lot 8312 | onion | SNGO | 1 | N/A | Goose feathers located in Field Lot 8312. Specimens are scattered and we are unable to determine the number of carcasses. Wings not collected due to advanced state of decay. |
| 05/24/2000 | T347NI01 | TL, Lot 8313 | onion | None | 0 | N/A | |
| 05/24/2000 | T347SI01 | TL, Lot 8314 | onion | None | 0 | N/A | |
| 05/31/2000 | T371XI01 | TL, Lot 8353, 8354 | onion | None | 0 | N/A | |
| 05/31/2000 | T368XI01 | TL, Lot 8348, 8398 | onion | None | 0 | N/A | |
| 06/01/2000 | T227SI01 | TL, Lot 8234 | onion | None | 0 | N/A | |
| 06/01/2000 | T217EI01 | TL, Lot 8226 | onion | None | 0 | N/A | |
| 06/06/2000 | T227NI01 | TL, Lot 8232 | onion | None | 0 | N/A | |
| 06/06/2000 | T363XI01 | TL, Lot 8338, 8339 | onion | None | 0 | N/A | |
| 06/06/2000 | T227CI01 | TL, Lot 8233 | onion | None | 0 | N/A | |

| Table 3. Results of Perimeter Surveys Conducted by Pesticide Impact Monitors on TLNWR and LKNWR – 2000 | | | | | | | |
|---|-------------------|-----------------------------|-------------|----------------------|----------|------------------------------|-----------------|
| Date | Survey ID# | Location^a | Crop | Affected Spp. | # | Condition^c | Comments |
| 05/01/2000 | T231EP01 | TL, Lot 8251 | potatoe | None | 0 | N/A | |
| 05/02/2000 | T229EP01 | TL, Lot 8249 | potatoe | None | 0 | N/A | |
| 05/02/2000 | T230EP01 | TL, Lot 8251 | potatoe | None | 0 | N/A | |
| 05/02/2000 | T231WP01 | TL, Lot 8252 | potatoe | None | 0 | N/A | |
| 05/04/2000 | T228XP01 | TL, Lot 8247 | potatoe | None | 0 | N/A | |
| 05/19/2000 | T214SP01 | TL, Lot 8270 | grains | None | 0 | N/A | |
| 05/19/2000 | T217XP01 | TL, Lot 8225,8226 | grains | None | 0 | N/A | |
| 05/26/2000 | T212XP01 | TL, Lot 8214, 8213 | grains | None | 0 | N/A | |
| 05/26/2000 | T210XP01 | TL, Lot 8218, 8217 | grains | None | 0 | N/A | |
| 05/30/2000 | T207XP01 | TL, Lot 8268 | grains | None | 0 | N/A | |
| 06/09/2000 | T364XP01 | TL, Lot 8340, 8341 | grains | None | 0 | N/A | |
| 06/15/2000 | T355SP01 | TL, Lot 8326 | grains | None | 0 | N/A | |
| 07/20/2000 | T228XP02 | TL, Lot 8247 | N/A | None | 0 | N/A | |
| 07/26/2000 | T231EP01 | TL, Lot 8353 | grains | None | 0 | N/A | |
| 08/04/2000 | T223XP02 | TL, Lot 8241, 8240 | onion | None | 0 | N/A | |
| 08/07/2000 | T227XP02 | TL, Lot 8232, 8233, 8234 | onion | None | 0 | N/A | |
| 08/08/2000 | T364XP02 | TL, Lot 8340, 8341 | potatoe | None | 0 | N/A | |
| 08/08/2000 | T363XP01 | TL, Lot 8338, 8339 | potatoe | None | 0 | N/A | |
| 08/09/2000 | T377NP01 | TL, Lot 8365 | onion | None | 0 | N/A | |
| 08/09/2000 | T343XP01 | TL, Lot 8307 | grains | None | 0 | N/A | |
| 08/10/2000 | T378XP01 | TL, Lot 8367, 8368 | potatoe | None | 0 | N/A | |
| 08/10/2000 | T379XP01 | TL, Lot 8369, 8370 | potatoe | None | 0 | N/A | |
| 08/10/2000 | T371XP01 | TL, Lot 8353, 8354 | onion | None | 0 | N/A | |
| 08/13/2000 | T348XP01 | TL, Lot 8315 | potatoe | None | 0 | N/A | |
| 08/13/2000 | T349XP01 | TL, Lot 8315, 8317 | potatoe | None | 0 | N/A | |
| 08/14/2000 | T344XP01 | TL, Lot 8308, 8309 | potatoe | None | 0 | N/A | |
| 08/14/2000 | T345XP01 | TL, Lot 8310, 8311 | potatoe | None | 0 | N/A | |
| 08/15/2000 | T203XP01 | TL, Lot 8205, 8206 | onion | None | 0 | N/A | |
| 08/15/2000 | T205WP01 | TL, Lot 8209, 8210 | potatoe | None | 0 | N/A | |
| 08/18/2000 | T347XP01 | TL, Lot 8313, 8314 | onion | None | 0 | N/A | |
| 08/18/2000 | T346XP01 | TL, Lot 8312 | onion | None | 0 | N/A | |

| Table 4. Results of Aquatic Surveys Conducted by Pesticide Impact Monitors on TLNWR and LKNWR – 2000 | | | | | | | |
|---|-------------------|-----------------------------|-------------|----------------------|----------|------------------------------|--|
| Date | Survey ID# | Location^a | Crop | Affected Spp. | # | Condition^c | Comments |
| 05/01/2000 | T231EW01 | TL, Lot 8251 | N/A | None | 0 | N/A | |
| 05/09/2000 | T102A1W1 | TL, drain 102-A-1 | N/A | None | 0 | N/A | |
| 05/10/2000 | TLDIMW01 | TL, Discovery Marsh | N/A | None | 0 | N/A | |
| 05/12/2000 | TLDIMW02 | TL, Discovery Marsh | N/A | CITE | 1 | D | Bite marks in breast indicating predation, no other trauma. Approx. 1m away from next, 8eggs in nest, 7of the 8 eggs are broken. |
| 05/19/2000 | T214SW01 | TL, Lot 8270 | N/A | None | 0 | N/A | |
| 05/19/2000 | T102C201 | TL, drain 102-C-2 | N/A | None | 0 | N/A | |
| 05/26/2000 | T102DRA1 | TL, drain 102 | N/A | None | 0 | N/A | |
| 05/26/2000 | T102DA01 | TL, drain 102-D | N/A | None | 0 | N/A | |
| 05/26/2000 | T102C1A1 | TL, drain 102-C-1 | N/A | None | 0 | N/A | |
| 05/30/2000 | T102DA01 | TL, drain 102-D | N/A | None | 0 | N/A | |
| 05/30/2000 | T102C2A1 | TL, drain 102-C-2 | N/A | None | 0 | N/A | |
| 06/12/2000 | T352XW01 | TL, Lot 8321 | grains | BCNH | 1 | D | Bird was found floating in the waterway. Position was recorded, no damage incurred to the body that is apparent. Specimen taken to office for necropsy . . . Later specimen is shipped for further examination into animal's death |
| 06/13/2000 | T353XW02 | TL, Lot 8321 | N/A | None | 0 | N/A | Survey is to recheck area, the same route was followed as 06/12/2000, except survey was performed from external side of the waterway from the field |

| Table 4 (Continued). Results of Aquatic Surveys Conducted by Pesticide Impact Monitors on TLNWR and LKNWR – 2000 | | | | | | | |
|---|-------------------|-----------------------------|-------------|----------------------|----------|------------------------------|-----------------|
| Date | Survey ID# | Location^a | Crop | Affected Spp. | # | Condition^c | Comments |
| 06/19/2000 | T373XW01 | TL, Lot 8357, 8358 | grains | None | 0 | N/A | |
| 06/19/2000 | T344XW01 | TL, Lot 8308, 8309 | grains | None | 0 | N/A | |
| 06/20/2000 | T386XW01 | TL, Lot 8378, 8384 | grains | None | 0 | N/A | |
| 06/22/2000 | T101B5W1 | TL, drain 101-B-5 | grains | None | 0 | N/A | |
| 06/22/2000 | TN15BW01 | TL, canal N-15-B | grains | None | 0 | N/A | |
| 06/28/2000 | T101B5W2 | TL, drain 101-B-5 | grains | None | 0 | N/A | |
| 06/28/2000 | TN12AW01 | TL, canal N-12-A | grains | None | 0 | N/A | |
| 07/06/2000 | T102C1BW1 | TL, drain 102-C-1-B | grains | None | 0 | N/A | |
| 07/06/2000 | TR-1XW01 | TL canal R-1 | grains | None | 0 | N/A | |
| 07/26/2000 | TQ3BXW01 | TL, canal Q-3-B | N/A | None | 0 | N/A | |
| 07/28/2000 | T390EW01 | TL, Lot 8388 | grains | None | 0 | N/A | |
| 07/28/2000 | T390EW02 | TL, Lot 8388 | grains | None | 0 | N/A | |
| 07/30/2000 | T390EW03 | TL, Lot 8388 | grains | None | 0 | N/A | |

| Table 4 (Continued). Results of Aquatic Surveys Conducted by Pesticide Impact Monitors on TLNWR and LKNWR – 2000 | | | | | | | |
|---|-------------------|-----------------------------|-------------|----------------------|----------|------------------------------|--|
| Date | Survey ID# | Location^a | Crop | Affected Spp. | # | Condition^c | Comments |
| 07/30/2000 | T390EW04 | TL, Lot 8388 | grains | None | 0 | N/A | |
| 07/31/2000 | T390EW05 | TL, Lot 8388 | grains | DCCO | 1 | I | Observed DCCO in N-15, swimming. Observation made at intersection of 390E and 390W. Intentional attempts to flush resulted in a diving response only. Bird did not appear able or willing to fly and either swam away or dove in response to flushing attempts. Noted difficulty in breathing (e.g. repeated choking episodes). No immediate action taken. Resurveyed that section of N-15 adjacent to the northern boundary of 390E after Disyston 8 application. |
| 07/31/2000 | T390EW06 | TL, Lot 8388 | grains | None | 0 | N/A | |

| Table 5. Results of Buffer Surveys Conducted by Pesticide Impact Monitors on TLNWR and LKNWR – 2000 | | | | | | | |
|--|-------------------|-----------------------------|-------------|----------------------|----------|------------------------------|-----------------|
| Date | Survey ID# | Location^a | Crop | Affected Spp. | # | Condition^c | Comments |
| 07/31/2000 | T390EB01 | TL, Lot 8388 | grains | None | 0 | N/A | |

| Table 6. In-Route Surveys Conducted by Pesticide Impact Monitors on TLNWR and LKNWR – 2000 | | | | | | | |
|---|-------------------|--|-------------|----------------------|----------|------------------------------|---|
| Date | Survey ID# | Location^a | Crop | Affected Spp. | # | Condition^c | Comments |
| 05/03/2000 | T228XR01 | TL, Lot 8247 | N/A | Vole sp. | 1 | D | In-route. While driving along the perimeter of 8247 we encountered one vole off the road. Specimen was collected for possible AChE submission. COD: predation. |
| 06/15/2000 | TEWRXR01 | TL, East-West Rd on the Bridge over the Lost River | N/A | BCNH | 1 | D | Noted that bird was a BCNH juvenile after pickup. Kill is estimated at 4-6 hours prior to pickup. Wing is broken and internal trauma noted. Cause of death: vehicle strike. |
| 07/18/2000 | TSMP1BR1 | TL, Sump 1-B, near joining of Sump 1-A | N/A | WHPE WEGR | 1 1 | I | No responses to intentional flush attempts by EJM. In Route from field to USFVHQ a WHPE was noticed acting strangely in Sump 1-B across from USFWS B2-M. Bird's throat patch appeared pale. Attempts to flush produced no response, lethargic behavior. Also encountered a WEGR in the same area. Note: There are scratches to its head and neck (possible predator attack). Bird refused to flush. Will re-observe tomorrow. |
| 09/08/2000 | Not collected | Lot C1-B | N/A | NOHA | 1 | I | Unable to fly, grossly underweight (exposed keel). Individual delivered to animal rehabilitator. Died on 09/15/2000. Cause of death likely starvation/stress. Specimen retrieved for possible cholinesterase analysis. |

| Table 7. Response Surveys Conducted by Pesticide Impact Monitors on TLNWR and LKNWR – 2000 | | | | | | | |
|---|-------------------|--|-------------|----------------------|----------|------------------------------|--|
| Date | Survey ID# | Location^a | Crop | Affected Spp. | # | Condition^c | Comments |
| 04/28/2000 | LKCOPTR1 | LK, Coyote Point | N/A | None | 0 | N/A | |
| 05/04/2000 | TRCANLR1 | TL, R-Canal at Eng. Channel | N/A | Sucker sp. | 13 | D | Response. Killed near the R-Canal, specimens collected by L. Bigoni and placed in the freezer. COD: unknown, but suspected to be due to human error (the fish screen for the new R-Canal wasn't put on correctly). |
| 05/18/2000 | TENGCHR1 | TL, near the English Channel & R-1 Canal | N/A | Muskrat | 1 | D | In-route to the R-Canal, Animal was picked up in the English Channel. Specimen was taken and placed in the freezer for possible AChE testing. COD: Drowning, animal was fished out from earlier on in the day. |
| 06/01/2000 | TSMP1AR1 | TL, Pump #11 | N/A | WHPE | 1 | D | Bird collected by biologists in airboat performing surveys for suckers. Bird was in the water, and once collected, dropped ashore approx. 100m south of Pump #11. D. Thompson then contacted the PIM Team for the retrieval of the specimen and Investigation of area. Specimen Collected for Necropsy. Appears moderately desiccated. |
| 07/07/2000 | T201XR01 | TL, Q-Canal next to 8202 | N/A | WEGR | 1 | D | Responding to a call to pick up an animal in the Q-Canal near 8202. No cause of death could be determined. No visible external impacts on the bird and carcass is relatively fresh (no decay to eyes). Specimen was put on ice until necropsy could be performed. |

| Table 7 (Continued). Response Surveys Conducted by Pesticide Impact Monitors on TLNWR and LKNWR – 2000 | | | | | | | |
|---|-------------------|---|-------------|----------------------|----------|------------------------------|--|
| Date | Survey ID# | Location^a | Crop | Affected Spp. | # | Condition^c | Comments |
| 07/11/2000 | TSUM1AR1 | TL, Sump 1-A near the canoe trail entrance on the East side | N/A | WHPE | 1 | D | Responding to a call regarding a WHPE mortality in the canoe trails in Sump 1-A, near the entrance ramp on the East side. After specimen was aquired, no cause of death could be pinpointed. Specimen was put on ice and stored until necropsy could determine Cause of Death. |
| 07/17/2000 | TSUM1AR2 | TL, Sump 1-A, near F&W B-6 | N/A | WHPE | 1 | D | Responding to a call from D. Thompson re: WHPE mortality off of the auto tour route near F&W B-6. COD: Autostrike. Specimen had external trauma to the body that is usually caused by vehicular strikes. |
| 07/19/2000 | TSUM1BR2 | TL, Sump 1-B, near joining of Sump 1-A | N/A | WHPE | 1 | D | Returning to the site where we observed a WHPE acting in an unusual manner the day before. On arrival, we located the pelican at the end of one of the pipes (on the Sump 1-A side) dead in the water. Specimen was collected for further investigation and for a necropsy. No sign of the WEGR at the site. |
| 09/13/2000 | not collected | Discovery Marsh | N/A | coyote | 1 | D | Response to coyote dead in discovery marsh. No external signs of trama. Necropsy indicate possible rodenticide poisoning. Specimen not retained for further analysis. |

| Table 8. Driving Surveys Conducted by Pesticide Impact Monitors on TLNWR and LKNWR – 2000 | | | | | | | |
|--|-------------------|-----------------------------|-------------|----------------------|----------|------------------------------|--|
| Date | Survey ID# | Location^a | Crop | Affected Spp. | # | Condition^c | Comments |
| 04/28/2000 | TSUM1AD1 | TL, Sump 1-A | N/A | None | 0 | N/A | |
| 05/15/2000 | KSTRDR01 | LK, Straits Drain Rd Area K | N/A | GREG | 1 | D | Evidence of predation seen. Specific cause of death unknown. Specimen not collected due to degree of decomposition |
| 05/16/2000 | TLDM5162 | TL, Discovery Marsh | N/A | None | 0 | D | |
| 05/16/2000 | TL516001 | TL, general roads | N/A | None | 0 | N/A | |
| 06/05/2000 | KSDRED2 | LK, Straits Drain Rd Area K | N/A | None | 0 | N/A | |
| 06/05/2000 | KSDRWD2 | LK, Straits Drain Rd Area K | N/A | None | 0 | N/A | Numerous CAGO wings (30+) observed along the roadway however, no carcasses observed |
| 07/12/2000 | T101B4D1 | TL, drain 101-B-4 | N/A | None | 0 | N/A | |
| 07/20/2000 | TL-Sump3 | TL, Sump 3 driving roads | N/A | None | 0 | N/A | |
| 07/24/2000 | LK | LK, Straits Drain Road | N/A | None | 0 | N/A | |
| 08/08/2000 | TAUTRD01 | TL, Auto Dr Road | N/A | None | 0 | N/A | |

| Table 9. Summary of Survey Results | | | | |
|---|--------------------------------------|----------------------------------|-------------------------------------|--|
| Survey Type | Number of Surveys^a | Number of Carcasses Found | Other Casualties^b | Number of Surveys with at least One Casualty Find |
| Infield | 31 | 2 | 0 | 2 |
| Aquatic | 29 | 2 | 1 | 3 |
| Perimeter | 49 | 0 | 0 | 0 |
| Buffer | 1 | 0 | 0 | 0 |
| Response | 9 | 20 | 0 | 8 |
| In-Route | 4 | 2 | 4 | 4 |
| Driving | 10 | 1 | 0 | 1 |
| Total | 133 | 27 | 5 | 18 |

| Table 10. Hydrolab Water Quality Data – R Canal Fish Kill – March 5- March 9, 2000 | | | | | | |
|---|------------------------|----------------------------|--------------------|-----------|-----------------------------------|----------------------|
| Time of Day HHMMSS | Temp. Deg C | DO % Saturation | DO mg/L | pH | SP Conductivity aeS/cm | I Batt. Volts |
| March 5, 2000 | | | | | | |
| 160000 | 15.34 | 45.2 | 3.92 | 8.69 | 806 | 10.4 |
| 170000 | 15.22 | 37.8 | 3.28 | 8.7 | 810 | 10.3 |
| 180000 | 15.19 | 32.2 | 2.8 | 8.71 | 813 | 10.3 |
| 190000 | 15.12 | 34.1 | 2.97 | 8.72 | 814 | 10.2 |
| 200000 | 15.02 | 28.8 | 2.51 | 8.68 | 815 | 10.2 |
| 210000 | 14.86 | 28.3 | 2.48 | 8.68 | 816 | 10.2 |
| 220000 | 14.71 | 24.1 | 2.12 | 8.67 | 815 | 10.1 |
| 230000 | 14.56 | 21.9 | 1.93 | 8.64 | 817 | 10.2 |
| March 6, 2000 | | | | | | |
| 0 | 14.46 | 21.2 | 1.87 | 8.65 | 818 | 10.1 |
| 10000 | 14.35 | 20.5 | 1.81 | 8.64 | 820 | 10.1 |
| 20000 | 14.28 | 20.1 | 1.79 | 8.64 | 821 | 10.1 |
| 30000 | 14.12 | 21.9 | 1.95 | 8.63 | 823 | 10.1 |
| 40000 | 14.01 | 24.2 | 2.16 | 8.62 | 826 | 10.1 |
| 50000 | 13.9 | 23.6 | 2.11 | 8.62 | 826 | 10.1 |
| 60000 | 13.81 | 22.5 | 2.01 | 8.61 | 826 | 10.1 |
| 70000 | 13.69 | 21.3 | 1.91 | 8.6 | 827 | 10.1 |
| 80000 | 13.65 | 19.8 | 1.78 | 8.57 | 827 | 10.1 |
| 90000 | 13.72 | 19.4 | 1.74 | 8.58 | 826 | 10 |
| 100000 | 14.07 | 27.8 | 2.48 | 8.66 | 820 | 10.1 |
| 110000 | 14.3 | 33.7 | 2.99 | 8.69 | 815 | 10 |
| 120000 | 14.72 | 32.8 | 2.88 | 8.68 | 813 | 10 |
| 130000 | 15.11 | 35.6 | 3.1 | 8.67 | 816 | 10 |
| 140000 | 14.67 | 25.7 | 2.26 | 8.59 | 819 | 10 |
| 150000 | 14.35 | 32 | 2.84 | 8.59 | 816 | 10 |
| 160000 | 14.15 | 27.8 | 2.47 | 8.58 | 817 | 10 |
| 170000 | 14.06 | 25.5 | 2.27 | 8.56 | 816 | 9.9 |
| 180000 | 13.96 | 25.4 | 2.27 | 8.55 | 814 | 9.9 |
| 190000 | 13.71 | 28.4 | 2.55 | 8.56 | 816 | 9.9 |
| 200000 | 13.65 | 27.1 | 2.44 | 8.55 | 813 | 9.9 |
| 210000 | 13.53 | 28.4 | 2.56 | 8.61 | 805 | 9.9 |
| 220000 | 13.35 | 31.3 | 2.83 | 8.59 | 804 | 9.9 |
| 230000 | 13.2 | 31.2 | 2.84 | 8.59 | 802 | 9.9 |
| March 7, 2000 | | | | | | |
| 0 | 13.11 | 32.6 | 2.96 | 8.62 | 798 | 9.8 |
| 10000 | 13.02 | 33.1 | 3.02 | 8.63 | 797 | 9.8 |
| 20000 | 12.9 | 33.8 | 3.09 | 8.62 | 796 | 9.8 |
| 30000 | 12.78 | 32.8 | 3.01 | 8.6 | 797 | 9.8 |
| 40000 | 12.61 | 32.7 | 3.01 | 8.6 | 796 | 9.7 |
| 50000 | 12.39 | 30 | 2.78 | 8.6 | 801 | 9.7 |
| 60000 | 12.37 | 31.8 | 2.95 | 8.6 | 795 | 9.7 |
| 70000 | 12.25 | 33.8 | 3.14 | 8.59 | 792 | 9.7 |
| 80000 | 12.19 | 33.7 | 3.13 | 8.59 | 791 | 9.7 |
| 90000 | 12.28 | 27.7 | 2.57 | 8.53 | 813 | 9.7 |
| 100000 | 12.47 | 28.1 | 2.59 | 8.52 | 804 | 9.7 |
| 110000 | 13.01 | 26.2 | 2.39 | 8.51 | 802 | 9.7 |
| 120000 | 13.54 | 23 | 2.07 | 8.51 | 808 | 9.7 |

| Table 10 (Continued). Hydrolab Water Quality Data –R Canal Fish Kill– March 5- Table 10. Hydrolab Water Quality Data – R Canal Fish Kill – March 5- March 9, 20009, 2000 | | | | | | |
|---|------------------------|----------------------------|--------------------|-----------|-----------------------------------|----------------------|
| Time of Day HHMMSS | Temp. Deg C | DO % Saturation | DO mg/L | pH | SP Conductivity aeS/cm | I Batt. Volts |
| 130000 | 13.91 | 23.2 | 2.07 | 8.48 | 804 | 9.7 |
| 140000 | 13.62 | 20.8 | 1.87 | 8.45 | 806 | 9.7 |
| 150000 | 14.54 | 33.5 | 2.96 | 8.52 | 817 | 9.7 |
| 160000 | 13.7 | 31.9 | 2.86 | 8.49 | 809 | 9.7 |
| 170000 | 13.54 | 36.8 | 3.32 | 8.5 | 807 | 9.7 |
| 180000 | 13.58 | 41.5 | 3.74 | 8.5 | 809 | 9.7 |
| 190000 | 13.36 | 41.8 | 3.79 | 8.49 | 809 | 9.6 |
| 200000 | 13.12 | 36.1 | 3.28 | 8.48 | 810 | 9.6 |
| 210000 | 12.96 | 33.4 | 3.05 | 8.46 | 810 | 9.6 |
| 220000 | 12.75 | 37.3 | 3.42 | 8.44 | 810 | 9.6 |
| 230000 | 12.65 | 30.4 | 2.8 | 8.42 | 811 | 9.6 |
| March 8, 2000 | | | | | | |
| 0 | 12.54 | 32.2 | 2.97 | 8.42 | 812 | 9.5 |
| 10000 | 12.45 | 30 | 2.77 | 8.4 | 812 | 9.5 |
| 20000 | 12.37 | 31.8 | 2.94 | 8.39 | 815 | 9.5 |
| 30000 | 12.17 | 30 | 2.79 | 8.35 | 814 | 9.5 |
| 40000 | 11.95 | 29.3 | 2.74 | 8.36 | 815 | 9.5 |
| 50000 | 11.91 | 29.5 | 2.76 | 8.36 | 814 | 9.5 |
| 60000 | 11.78 | 29.1 | 2.73 | 8.36 | 815 | 9.4 |
| 70000 | 11.74 | 33.4 | 3.14 | 8.41 | 807 | 9.4 |
| 80000 | 11.74 | 33.1 | 3.11 | 8.42 | 806 | 9.4 |
| | | | | | | |

Figure 1a. Hydrolab Water Quality Monitoring - R Canal Fish Kill

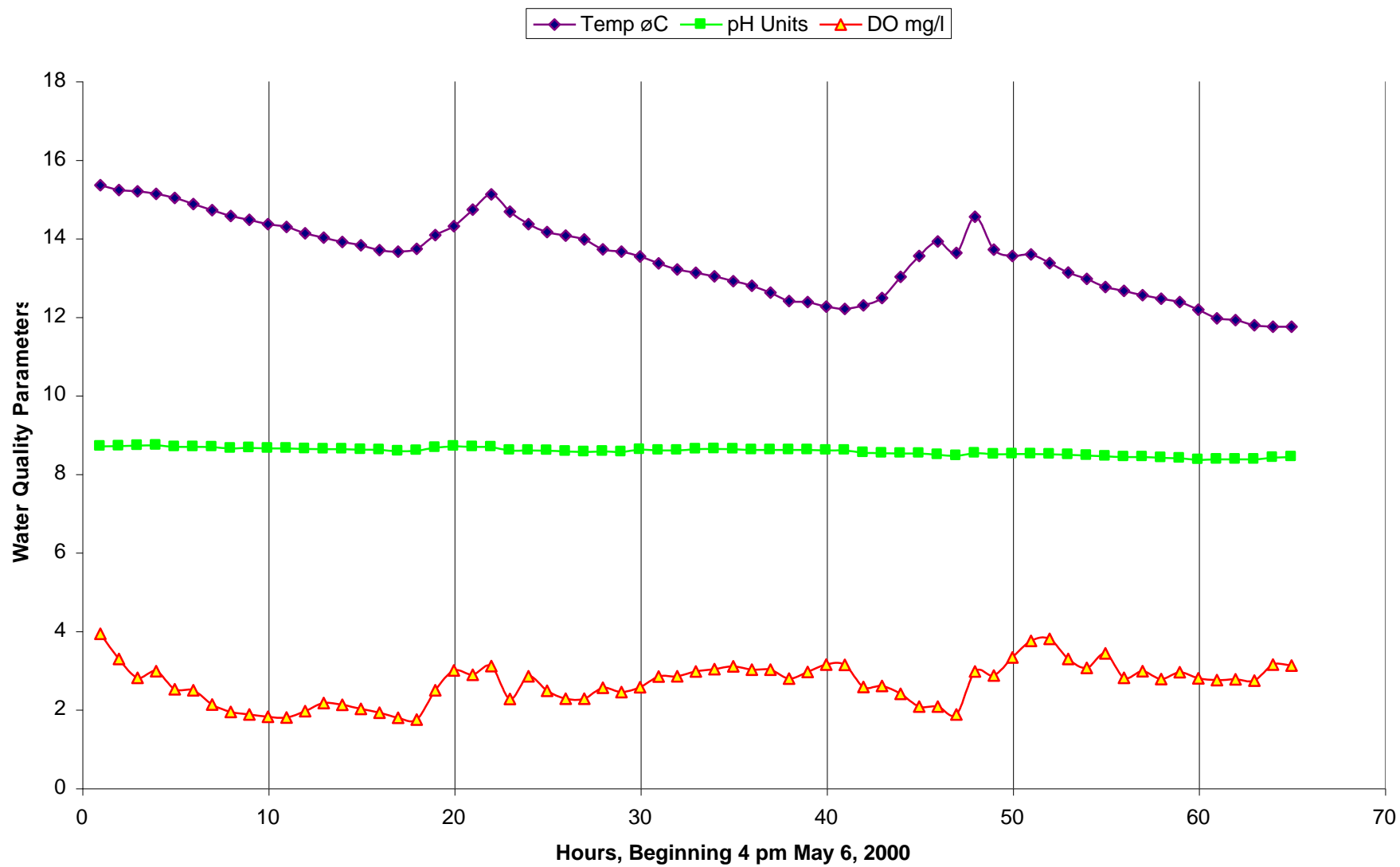
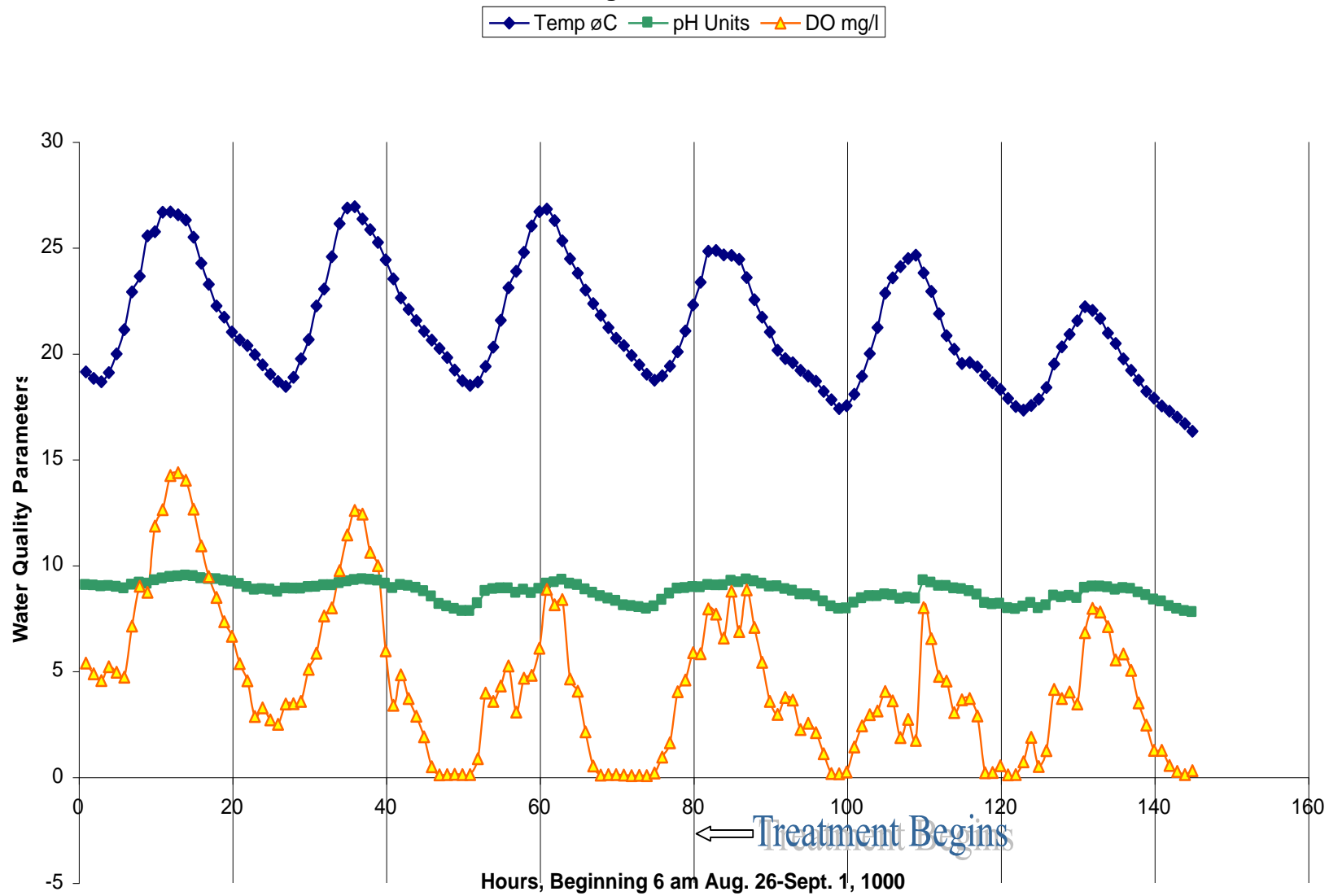


Figure 1b. Water Quality Monitoring for Purple Loosestrife Treatment,
Aug. 29, 2000



Appendix B –Reports from Test Facilities and Necropsy Forms

ENVIRONMENTAL CONTAMINANTS PROGRAM

PESTICIDE INVESTIGATIONS IN TULE LAKE NWR

NECROPSY FORM-YEAR 2000

SPECIES: black crowned night heron (adult)

GENDER: Undetermined

LOCATION FOUND:

FOUND BY: Ed Merrill

GPS: LAT/LON: N 41 55 48.5 W121 28 01.4

UTM: 0627095/4643156

COLLECTED BY: Ed Merrill and Deborah Giovanis

DATE: 6-12-00

TIME: 1131H

PHOTO'S TAKEN ?

OF PHOTOS

FILE NAMES:

Y N

DESCRIPTION OF INCIDENT SCENE: Adult black crowned night heron was found floating ventral side up in 101-c-4 drain at its intersection with the drain that forms the northern boundary of Tule Lake Lease Lot # 352 – 8321. Carcass was located approximately 1 meter west of the 101-c-4 drainpipe. (See vegmap01.jpg and photos)

Proximity to H2O: Found in water in 101-c-4 drain

Weather: SC: 3 Beaufort Scale: 2 Temp. (F) 60 degrees Precip: 0%

EXTERNAL OBSERVATIONS: Carcass was ventral side up in water for an undetermined period prior to discovery. Unable to properly and fully evaluate external condition due to wet condition of carcass and feather matting.

GENERAL HEALTH: appearance – slightly emaciated as evaluated by protrusion of ventral aspect of keel vs. amount of breast muscle present. Note: this appearance may be a function of the amount of time carcass spent partially submerged in water.

TRAUMA: No evidence of lacerations, fractures, bite marks (predation), projectile entry/exit holes or other puncture wounds observed.

LESIONS: No evidence of lesions observed.

REMARKS: No evidence of infectious processes or other abnormalities observed in the area of the oral cavity or the vent. (Evidence may have been corrupted by time in water)

Hindneck feathers intact and used as Species ID confirmation.

INTERNAL OBSERVATIONS: Abdominal cavity opened longitudinally by EJM. Contents observed but not disturbed. Photos taken.

ORAL CAVITY: No evidence of trauma or infectious processes observed. (See photo)

GIZZARD: N/E

LUNGS: N/E

LIVER: Several 3-5 mm dark spots observed on surface of one lobe. (See photos)

INTESTINES: N/E

OTHER: None

REMARKS: No evidence of hemorrhagic processes observed in abdominal cavity.

SPECIMENS TAKEN AND TESTS REQUESTED:

Frozen whole carcass delivered to USFWS Clark R. Bavin Forensics Lab in Ashland, OR by Ed Merrill.

Requested:

1. COD necropsy
2. GC/MS analysis of back feathers, plantar skin (feet) and GI contents for Disyston contamination.

SUBMITTED TO: Mr. Darrell xxxxxx

DATE: 6-13-00

STORAGE: (Frozen/refrigerated/other) Frozen

PRESERVATIVE USED: None

CARRIER: Ed Merrill, Team leader, Pesticide Impact Monitoring, KBNWR

CHAIN OF CUSTODY: Yes. COC tape and COC form used

RELEASED TO: Mr. DArrell

SUBMITTED BY: Ed Merrill

RESULTS RECEIVED:

OF ATTACHMENTS:

NECROPSY PERFORMED BY:_____ **DATE:**_____

PROXIMATE CAUSE OF DEATH:

SECONDARY CAUSE OF DEATH:

OTHER CONTRIBUTING FACTORS:

ENVIRONMENTAL CONTAMINANTS PROGRAM

PESTICIDE INVESTIGATIONS IN TULE LAKE NWR

NECROPSY FORM-YEAR 2000

SPECIES: black crowned night heron (juvenile)

GENDER: undetermined

LOCATION FOUND: Lost River bridge on East-West Rd. Tule Lake, Ca Siskiyou County

FOUND BY: Ed Merrall & Deb Giovanis

GPS: LAT/LON:

UTM:

COLLECTED BY: Same as FOUND BY

DATE: 6/15/00

TIME: 1100 H

PHOTO'S TAKEN ?

OF PHOTOS

FILE NAMES:

Y N

DESCRIPTION OF INCIDENT SCENE:

Carcass found lying in Westbound lane of East-West Rd on bridge surface---deceased.

Proximity to H2O: N/A

Weather: SC _____ Beaufort Scale _____ Temp. (F) _____ Precip: _____

EXTERNAL OBSERVATIONS: Specimen did not exhibit any obvious external signs of Sx's

GENERAL HEALTH: appeared WNL

TRAUMA: Fx of two cervical vertebrae
Fx of left femur
Fx of pelvic girdle

LESIONS: None observed

REMARKS: Possible minor fx's of additional cervical vertebrae

INTERNAL OBSERVATIONS:

ORAL CAVITY: Evidence of blood present in throat and mouth

GIZZARD: N/E

LUNGS: Large blood clots observed in thoracic and abdominal cavities

LIVER: Same as Above

INTESTINES: WNL

OTHER:

REMARKS:

SPECIMENS TAKEN AND TESTS REQUESTED: NONE

SUBMITTED TO: N/A

DATE:

STORAGE: (Frozen/refrigerated/other)

PRESERVATIVE USED:

CARRIER:

CHAIN OF CUSTODY:

RELEASED TO:

SUBMITTED BY:

NECROPSY PERFORMED BY: _____ DATE: _____

RESULTS RECEIVED: N/A

OF ATTACHMENTS:

PROXIMATE CAUSE OF DEATH: Pattern of trauma is consistent with vehicle strike mortality

SECONDARY CAUSE OF DEATH: undetermined

OTHER CONTRIBUTING FACTORS: undetermined

ENVIRONMENTAL CONTAMINANTS PROGRAM

PESTICIDE INVESTIGATIONS IN TULE LAKE NWR

NECROPSY FORM-YEAR 2000

SPECIES: White pelican

GENDER: Undetermined

LOCATION FOUND: Located by D. Thomson and J. Beckstrand in Sump 1-A near pump 11.

FOUND BY: D. Thomson and J. Beckstrand

GPS: LAT/LON: N 41 53 55.1 W 121 29 45.2

UTM: 0624765E/4639616N

COLLECTED BY: Ed Merrall

DATE: 6/1/00

TIME: 1503H

PHOTO'S TAKEN ?

OF PHOTOS

FILE NAMES:

Y N

DESCRIPTION OF INCIDENT SCENE:

Carcass was discovered in the water in Sump 1-A and subsequently placed along A dyke for PIM's to retrieve.

Proximity to H2O: IN THE WATER IN SUMP 1-A

Weather: SC: 0 Beaufort Scale: 3 Temp. (F) 72 degrees Precip: 0%

EXTERNAL OBSERVATIONS: Carcass appears to have been subjected to post-mortem scavenging so cause of death may be impossible to determine. Tissue and feathers of thoracic and abdominal area are missing. Major organ systems removed. Ribs severed from keel. Evidence of dessication of remaining tissues.

GENERAL HEALTH: Unable to determine due to scavenging impact

TRAUMA: Abdominal & thoracic trauma presumed to be due to predation and/or post-mortem scavenging.

LESIONS: None observed

REMARKS: Upon palpation of carcass, no evidence of fracture in wings, neck, legs or skull. Feet and wings intact.

INTERNAL OBSERVATIONS:

ORAL CAVITY: Clear

GIZZARD: N/E

LUNGS: N/E - scavenged

LIVER: N/E - scavenged

INTESTINES: N/E - scavenged

OTHER: Vent area missing due to scavenging

REMARKS: Pattern of trauma is consistent with predation and/or post-mortem scavenging

SPECIMENS TAKEN AND TESTS REQUESTED:

NONE

SUBMITTED TO: N/A

DATE:

STORAGE: (Frozen/refrigerated/other)

PRESERVATIVE USED:

CARRIER:

CHAIN OF CUSTODY:

RELEASED TO:

SUBMITTED BY:

NECROPSY PERFORMED BY: _____ DATE: _____

RESULTS RECEIVED: N/A

OF ATTACHMENTS:

PROXIMATE CAUSE OF DEATH: UNABLE TO DETERMINE

SECONDARY CAUSE OF DEATH: UNABLE TO DETERMINE

OTHER CONTRIBUTING FACTORS: POSSIBLE PREDATION W/ POST-MORTEM SCAVENGING

ENVIRONMENTAL CONTAMINANTS PROGRAM

PESTICIDE INVESTIGATIONS IN TULE LAKE NWR

NECROPSY FORM-YEAR 2000

SPECIES: White pelican

GENDER: undetermined

LOCATION FOUND: approx 50m from Sump 1-A/A dyke shoreline - in water at canoe trail put-in

FOUND BY: Dave Whaley

GPS: LAT/LON: not available

UTM: not available

COLLECTED BY: Deb Giovanis and Denise

DATE: 7/11/00

TIME: approx 1000H

PHOTO'S TAKEN ?

OF PHOTOS

FILE NAMES:

Y N

DESCRIPTION OF INCIDENT SCENE:

Proximity to H2O: in water @ canoe trail put-in

Weather: SC: 0

Beaufort Scale: 2

Temp. (F): 79 degrees

Precip: 0%

EXTERNAL OBSERVATIONS:

GENERAL HEALTH: appears WNL

TRAUMA: puncture wound anterior end of keel

LESIONS: none observed

REMARKS: upon close examination puncture wound does not exhibit any sign of penetration of underlying tissue therefore, possible laceration. Underlying tissue does not exhibit any evidence of petechiae, hemorrhagic process or other evidence of trauma.

INTERNAL OBSERVATIONS:

ORAL CAVITY: CLEAR

GIZZARD: N/E

LUNGS: appeared atrophied and spongelike surface texture. Color appeared WNL

LIVER: WNL

INTESTINES: WNL

OTHER: No evidence of infectious processes in areas of oral/vent cavities or eyes.

REMARKS:

SPECIMENS TAKEN AND TESTS REQUESTED:

NONE TAKEN OR SUBMITTED

SUBMITTED TO: N/A

DATE:

STORAGE: (Frozen/refrigerated/other)

PRESERVATIVE USED:

CARRIER:

CHAIN OF CUSTODY:

RELEASED TO:

SUBMITTED BY:

NECROPSY PERFORMED BY: _____ DATE: _____

RESULTS RECEIVED: N/A

OF ATTACHMENTS:

PROXIMATE CAUSE OF DEATH: UNDETERMINED

SECONDARY CAUSE OF DEATH: UNDETERMINED

OTHER CONTRIBUTING FACTORS: UNDETERMINED

ENVIRONMENTAL CONTAMINANTS PROGRAM

PESTICIDE INVESTIGATIONS IN TULE LAKE NWR

NECROPSY FORM-YEAR 2000

SPECIES: White pelican

GENDER: undetermined

LOCATION FOUND: Approximately 50 yds. South of Auto Tour Rd. on access road parallel to 102-c-1

FOUND BY: D. Thomson

GPS: LAT/LON: not available

UTM: not available

COLLECTED BY: Ed Merrill & Deb Giovanis

DATE: 7/17/00

TIME: 1100H

PHOTO'S TAKEN ?

OF PHOTOS

FILE NAMES:

Y N

DESCRIPTION OF INCIDENT SCENE:

Carcass was located on west side of access road parallel to 102-c-1 in NE section of Tule Lake Sump 2 lease lots.

Proximity to H2O: approx. 6m from 102-c-1

Weather: SC: 1

Beaufort Scale: 2

Temp. (F): 79degrees

Precip: 0%

EXTERNAL OBSERVATIONS: eyes missing indicating some degree of post-mortem dessication.

GENERAL HEALTH: appeared WNL

TRAUMA: Palpation of entire carcass revealed: Fx - right wing @ elbow and Fx - right side of cranium.
2.5 cm laceration - left medial aspect of dorsal surface

LESIONS: none observed

REMARKS: Dorsal laceration initially appeared to be puncture wound possibly from projectile. Upon closer examination it was determined to be a laceration. Also, no exit wound was located or observed therefore, R/O gunshot wound.

INTERNAL OBSERVATIONS: NOT PERFORMED

ORAL CAVITY:

GIZZARD:

LUNGS:

LIVER:

INTESTINES:

OTHER:

REMARKS:

SPECIMENS TAKEN AND TESTS REQUESTED: NONE

ENTIRE CRANIUM RETAINED FROZEN FOR POSSIBLE FUTURE AChE ASSAY.

SUBMITTED TO: N/A

DATE:

STORAGE: (Frozen/refrigerated/other)

PRESERVATIVE USED:

CARRIER:

CHAIN OF CUSTODY:

RELEASED TO:

SUBMITTED BY:

NECROPSY PERFORMED BY: _____ DATE: _____

RESULTS RECEIVED: N/A

OF ATTACHMENTS:

PROXIMATE CAUSE OF DEATH: Pattern of trauma is consistent with vehicle strike mortality

SECONDARY CAUSE OF DEATH: none determined

OTHER CONTRIBUTING FACTORS: none determined

ENVIRONMENTAL CONTAMINANTS PROGRAM

PESTICIDE INVESTIGATIONS IN TULE LAKE NWR

NECROPSY FORM-YEAR 2000

SPECIES: White pelican

GENDER: undetermined

LOCATION FOUND:

FOUND BY: Ed Merrill/Deb Giovanis

GPS: LAT/LON:

UTM:

COLLECTED BY: Ed Merrill

DATE: 7/19/00

TIME:

PHOTO'S TAKEN ?

OF PHOTOS

FILE NAMES:

Y

DESCRIPTION OF INCIDENT SCENE:

White pelican was observed in Sump 1-B along Western shoreline. Appeared lethargic and upon intentional flush attempt by E Merrill the bird stumbled and used its wings to balance and then right itself. Bird did not respond to repeated attempts to flush.

Proximity to H2O: In drain pipe leading from Sump 1-B into English Channel

Weather: SC: 0

Beaufort Scale: 0

Temp. (F): 85degrees

Precip: 0%

EXTERNAL OBSERVATIONS: Throat pouch and feet appear severely pale/anemic . No orange coloration present.

GENERAL HEALTH: appeared lethargic (pre-mortem) eyelids appear pale

TRAUMA: None observed

LESIONS: none observed

REMARKS: Slight to moderate emaciation observed and evidenced by amount of muscle/breast tissue present vs. keel protrusion

INTERNAL OBSERVATIONS:

ORAL CAVITY: No evidence of hemorrhagic or infectious processes

GIZZARD: Not observed

LUNGS: Appeared severely atrophied , sponge-like surface texture

LIVER: appeared WNL

INTESTINES: appeared WNL

OTHER: None

REMARKS: Bird was discovered on dry ground and exhibited no signs of hemorrhagic or infectious processes in the oral, vent or eye areas

SPECIMENS TAKEN AND TESTS REQUESTED: NONE

SUBMITTED TO: N/A

DATE:

STORAGE: (Frozen/refrigerated/other)

PRESERVATIVE USED:

CARRIER:

CHAIN OF CUSTODY:

RELEASED TO:

SUBMITTED BY:

NECROPSY PERFORMED BY: _____Ed Merrall_____ DATE: __7/19/00_____

RESULTS RECEIVED: N/A

OF ATTACHMENTS:

PROXIMATE CAUSE OF DEATH: not determined

SECONDARY CAUSE OF DEATH: none determined

OTHER CONTRIBUTING FACTORS: none determined

ENVIRONMENTAL CONTAMINANTS PROGRAM

PESTICIDE INVESTIGATIONS IN TULE LAKE NWR

NECROPSY FORM-YEAR 2000

SPECIES: Canis Latrans

GENDER: male

LOCATION FOUND: South of Discovery Marsh

FOUND BY: Carl Millegan

GPS: LAT/LON:

UTM:

COLLECTED BY: Ed Merrall & Deb Giovanis

DATE: 9/13/00

TIME: 1330H

PHOTO'S TAKEN ?

OF PHOTOS

FILE NAMES:

Y

DESCRIPTION OF INCIDENT SCENE:

Carcass was discovered during herbicide application along Southern perimeter of discovery marsh. Carcass was found on North side of drain

Proximity to H2O: immediately adjacent to drain

Weather: SC: Beaufort Scale:

Temp. (F): 85degrees

Precip: 0%

EXTERNAL OBSERVATIONS:.

GENERAL HEALTH: appears excellent. No evidence of trauma. Pelage appears healthy. No evidence of blood or infectious processes in oral or vent areas. No puncture wounds or evidence of blunt trauma.

TRAUMA:

LESIONS: none observed

REMARKS:

INTERNAL OBSERVATIONS: NOT PERFORMED

ORAL CAVITY: appears normal except that tongue and mucous membranes appear pale

GIZZARD: n/a

LUNGS: appear normal

LIVER: several lobes displayed white lesions 1-2 mm

INTESTINES: Appeared to be evacuated and inflated

OTHER: Abdominal cavity filled with blood. While examing intestines extracted two parasitic worms 1) 12-14 inch long, 2) 7-9 inch long.

REMARKS:

SPECIMENS TAKEN AND TESTS REQUESTED: excised stomach containing ingesta and retained frozen.

SUBMITTED TO: N/A

DATE:

STORAGE: (Frozen/refrigerated/other)

PRESERVATIVE USED:

CARRIER:

CHAIN OF CUSTODY:

RELEASED TO:

SUBMITTED BY:

NECROPSY PERFORMED BY: ____Ed Merrill____ DATE: __9/13/00__

RESULTS RECEIVED: N/A

OF ATTACHMENTS:

PROXIMATE CAUSE OF DEATH: Possible rodenticide poisoning.

SECONDARY CAUSE OF DEATH: none determined

OTHER CONTRIBUTING FACTORS: none determined

ENVIRONMENTAL CONTAMINANTS PROGRAM

PESTICIDE INVESTIGATIONS IN TULE LAKE NWR

NECROPSY FORM-YEAR 2000

SPECIES: Northern Harrier (juvenile)

GENDER: suspect female

LOCATION FOUND: C1-B

FOUND BY: Ed Merrill

GPS: LAT/LON:

UTM:

COLLECTED BY: Ed Merrill

DATE: 9/8/00

TIME: approx. 1430 H

PHOTO'S TAKEN ?

OF PHOTOS

FILE NAMES:

Y N

DESCRIPTION OF INCIDENT SCENE:

This bird hopped across the mowed pathway to the EBBR station in field C1-B. She appeared to be unable to take flight. I walked over and was able to pick her up without difficulty. There were no indicators at the incident scene that would contribute to the subsequent investigation. The bird was taken to Everett Veterinary Hospital for examination. She appeared to be grossly underweight and suffering from starvation as evidenced by the degree of breast muscle atrophy and keel protrusion. This bird was retained and fed live mice ad libitum for 6 days. It was determined that the bird was responding to the treatment and should be released to a wildlife rehabber. No signs or Sx of impending lethality were observed. The bird was then released to Susan McKinley of Merrill, Oregon. The harrier was discovered expired the next AM.

Proximity to H2O:

Weather: SC_0_____ Beaufort Scale_0_____ Temp. (F)_85_____ Precip:0_____

EXTERNAL OBSERVATIONS: Mod to extreme atrophy of breast tissue suggesting emaciation and starvation

GENERAL HEALTH: appears WNL

TRAUMA: none observed

LESIONS: none observed

REMARKS: No signs or Sx of FX or trauma. No evidence of infectious processes around oral or vent areas.

INTERNAL OBSERVATIONS:

ORAL CAVITY:

GIZZARD:

LUNGS:

LIVER:

INTESTINES:

OTHER:

REMARKS:

SPECIMENS TAKEN AND TESTS REQUESTED:

SUBMITTED TO:

DATE:

STORAGE: (Frozen/refrigerated/other)

PRESERVATIVE USED:

CARRIER:

CHAIN OF CUSTODY:

RELEASED TO:

SUBMITTED BY:

RESULTS RECEIVED:

COPY ATTACHED: Y N

PRIMARY CAUSE OF DEATH__STARVATION_____

SECONDARY CAUSE OF DEATH__STRESS_____

OTHER CONTRIBUTING FACTORS_POSSIBLE DEHYDRATION_____

NECROPSY PERFORMED BY:_____ DATE:_____

Appendix C – Incident Report

Incident Report

By Ed Merrill
Adult black-crowned night heron
June 12, 2000

Summary

On Sunday June 11, 2000 at approximately 7AM a combination aerial/ground application of Disyston 8 (disulfoton) and 2,4-D occurred on the barley planting of Tule Lake Lease Lot (TLL) 352-8321. The barley section of this lease is located on the western one-third of the lot. On Monday June 12, 2000, at 10:00 AM U.S. Fish and Wildlife Service (Service) Pesticide Impact Monitoring (PIM) personnel commenced a post-application buffer zone and field perimeter survey of the treated barley planting. At approximately 11:00 AM that day PIM Ed Merrill, observed a dead black-crowned night heron (BCNH) floating ventral side up at the intersection of drains 101-C-4 and the undesignated drain forming the northern boundary of the aforementioned lease lot (TLL352-83210). The intersection of these two drains is the NW corner of TLL 352-8321. The BCNH carcass was recovered from the drain and a necropsy performed and recorded by Ed Merrill the afternoon of the same day.

The necropsy revealed a finding of emaciation as determined by palpation of the breast tissue. The etiology of the significantly reduced/atrophied breast tissue was not revealed at necropsy however, inadequate nutrition of unknown duration was indicated. The immediate cause of death was not apparent. The lack of significant findings upon necropsy and the fact that the carcass was discovered in proximity to a Disyston 8 (disulfoton) application prompted the submission of the carcass to the Service's Wildlife Forensic Lab in Ashland, Oregon for further examination. The BCNH carcass was submitted for analysis of the gut, back feathers and plantar skin of the feet for evidence of pesticide contact/exposure. The carcass was delivered to the Forensic Lab on Tuesday June 12, 2000. Pathology results indicate that the suspected cause of death was related to a nematode infestation. No evidence of disulfoton or other organophosphate (OP) exposure was detected. The brain tissue was submitted to the California Animal Health and Food Safety Lab (CAHFS) in Davis, Ca. for cholinesterase (AChE) analysis. The results are within the normal range.

Pursuant to facts revealed by the leaseholder at the time of the TLL 352-8321 survey regarding an undocumented 2,4-D application on the lot, vegetation samples (11) were collected. Samples were obtained from the barley planting treated areas, surrounding buffer zones and field perimeter. Samples were collected on June 15, 2000 at 10:00 AM and submitted to the California Animal Health and Food Safety (CAHFS) Lab at U.C. Davis, CA for disulfoton and 2,4-D residue analysis. Laboratory results indicate 5 samples positive for 2,4-D and all samples negative for disulfoton.

Background

Monday morning June 12, 2000 PIM personnel received from Siskiyou County Ag. Dept. (SCAD) Notice of Intent (NOI) documents with permit numbers for aerial applications of Disyston 8 (disulfoton) on multiple Tule Lake NWR lease lots. While SCAD received an NOI from Macy's Flying Service regarding TLL 352-8321 on Thursday June 8, 2000, SCAD did not provide notice to the Service's PIM's, in the customary manner until Saturday June 10, 2000 thereby, precluding any application scrutiny by USFWS PIM's. Pre-application sign posting, required by the product label and California DPR's, on the barley planting of TLL 352-8321 indicated that aerial application was scheduled to occur Sunday June 11, 2000 at 6:45 AM. Indications are that this application occurred as posted and a 2,4-D application occurred at the same time. The 2,4-D application was not accompanied by the required written NOI nor was "ground trim" application of Disyston 8 (disulfoton) indicated on the associated NOI. SCAD personnel indicated that a "...verbal NOI" was submitted for the 2,4-D application. It should be noted here that California Department of Pesticide Regulations do not contain a provision for verbal NOI's. These deficiencies prevented the Service's PIM personnel from making fully informed decisions regarding the proper Personal Protective Equipment (PPE) to employ during the course of their duties thereby, potentially endangering their health.

Disulfoton is defined in the PIM protocol (Environmental Contaminants – Pesticide Impact Monitoring) as a "high priority" pesticide of concern. Specific post-application survey requirements are prescribed by the protocol. As required by the protocol, PIM personnel conducted a buffer zone and field perimeter search of the treated area of TLL 352-8321 on Monday June 12, 2000 at 10:00 AM. During the course of the search an adult black-crowned night heron casualty/carcass was discovered in the drain at the NW corner of the lease lot. The carcass was observed floating ventral side up in the water at the intersection of 101-C-4 drain and the drain (undesigned) forming the northern boundary of the lease lot. The carcass was retrieved in accordance with the sample collection requirements of the governing protocol and a necropsy subsequently performed that afternoon by PIM Ed Merrill. The necropsy revealed evidence of emaciation and possible intra-abdominal adhesions but no other remarkable findings. Due to the spatio-temporal proximity of the BCNH casualty to the disulfoton/2,4-D application it was determined that the carcass should be transported to the Service's Wildlife Forensic Lab for further examination on Tuesday, June 13, 2000 at approximately 3:00 PM.

At the time of the survey the leaseholder revealed that a 2,4-D had been applied in conjunction with the Disyston 8 application. This application was undocumented and therefore unknown to PIM personnel. Consequently, a decision was made to verify compliance with PUP buffer zone requirements by collecting vegetation samples from the lease lot barley planting and surrounding areas for residue analysis. Eleven vegetation samples were collected on Thursday June 15, 2000 between 10:00 AM and 12:00 PM. Vegetation samples were taken approximately 100 hours post-application. Samples were collected from the treated areas within the field, untreated buffer zones and perimeter areas. GPS locations were recorded and samples forwarded to CAHFS

for residue analysis.

Laboratory Analyses

Pathological examination of the BCNH was performed by Dr. Richard Stroud of the Service's Forensic Lab and revealed that the suspected cause of death was starvation as a complication of Eustrongyloidosis (nematode infestation). Roundworms appeared to have infiltrated (Eustrongyloides spp.) the liver area of the abdominal cavity. These parasites typically cause intra-abdominal adhesions that constrict the intestines and eventually lead to starvation and death. No evidence of pesticide residues was found on any of the BCNH tissue samples analyzed. Dr. Stroud also suggests that the time of death may have preceded the pesticide application. The investigative results are consistent with a cause of death due to roundworm infestation by Eustrongyloides spp. and the predictable disease course associated with such infestation. No evidence of acute exposure to Disyston 8 or other OP's was revealed by necropsy or subsequent toxicology analyses. The BCNH brain cholinesterase (AChE) level is within the normal range.

Eleven vegetation samples collected from TLL 342-8321 were submitted to CAHFS for residue analysis. The three barley samples (#'s 3, 5, and 6) were separated into vegetative and root fractions resulting in a total of 14 unique specimens. Residue analyses detected the presence of 2,4-D on 5 of 14 plant specimens. Sample #1 (1 ppm 2,4-D) was collected at the 101-C-4 drain aquatic/terrestrial interface and was, clearly, outside the PUP mandated 25 ft. buffer zone. Sample #11 (2 ppm 2,4-D) was collected to the west of the 101-C-4 drain and approximately 35 meters beyond the field proper. Both samples were collected outside the field proper and the positive results suggest the likelihood of pesticide drift. Vegetation sample #1 (1 ppm 2,4-D), was collected at the aquatic/terrestrial interface immediately adjacent to the 101-C-4 drain water and poses particular concern. The implication is that the PUP required 25ft. buffer zone for ground application of 2,4-D may not be adequate to prevent contamination of sensitive aquatic sites in the absence of minimum tolerance levels. While not posing any immediate contamination threat to aquatic sites the 2 ppm value for sample #11 provides additional corroboration of the drift hypotheses. No water samples were collected, therefore, contamination of 101-C-4 drain water cannot be demonstrated. All other 2,4-D positive samples were contained within the treated area. Disulfoton (Disyston 8) residue was not detected on any of the 14 specimens.

Disulfoton is rapidly metabolized (half-life 2.6 days) by plant tissue to its cholinesterase inhibiting sulfoxide and sulfone derivatives rapidly rendering the parent compound undetectable on vegetative or root structures (Flint, 1989). The disulfoton derivatives are equivalent in toxicity to the parent compound in terms of their cholinesterase inhibition activity. While many labs routinely analyze for the parent compound and possess the appropriate standards for such analysis, only the California Food and Agriculture Department's Center for Analytical Chemistry - Pesticide Residue Lab was capable of performing the desired disulfoton derivative analysis. Their minimum sample requirement – 2 lb. of sample material – grossly exceeded our remaining sample inventory therefore, analysis of vegetation samples for disulfoton metabolites was not

feasible. These technical limitations however, may explain the negative disulfoton results for those specimens that positive results were anticipated including sample #6, the intended positive control collected from the disulfoton treated area.

References

Flint, D (et al) 1989. DI - SYSTON Scientific Seminar. In: The Proceedings of the DI-SYSTON Scientific Seminar, pp.40-59. Informal document.

Table 1. Vegetation sample residue analysis. BCNH incident-TLL 352-8321.

| Sample # | ppm 2,4-D (MDL –1ppm) | ppm disulfoton (MDL – 0.1MDL) |
|------------------------|-----------------------|-------------------------------|
| 1. Mustard | 1 ppm | Not detected |
| 2. Stinging nettle | Not detected | Not detected |
| 3a. Barley, vegetative | Not detected | Not detected |
| 3b. Barley, roots | Not detected | Not detected |
| 5a. Barley vegetative | 1 ppm | Not detected |
| 5b. Barley, roots | Not detected | Not detected |
| 6a. Barley, vegetative | 35 ppm | Not detected |
| 6b. Barley, roots | 2 ppm | Not detected |
| 7. Composite | Not detected | Not detected |
| 8. Unknown | Not detected | Not detected |
| 9. Composite | Not detected | Not detected |
| 10. Composite | Not detected | Not detected |
| 11. Grass species | 2 ppm | Not detected |

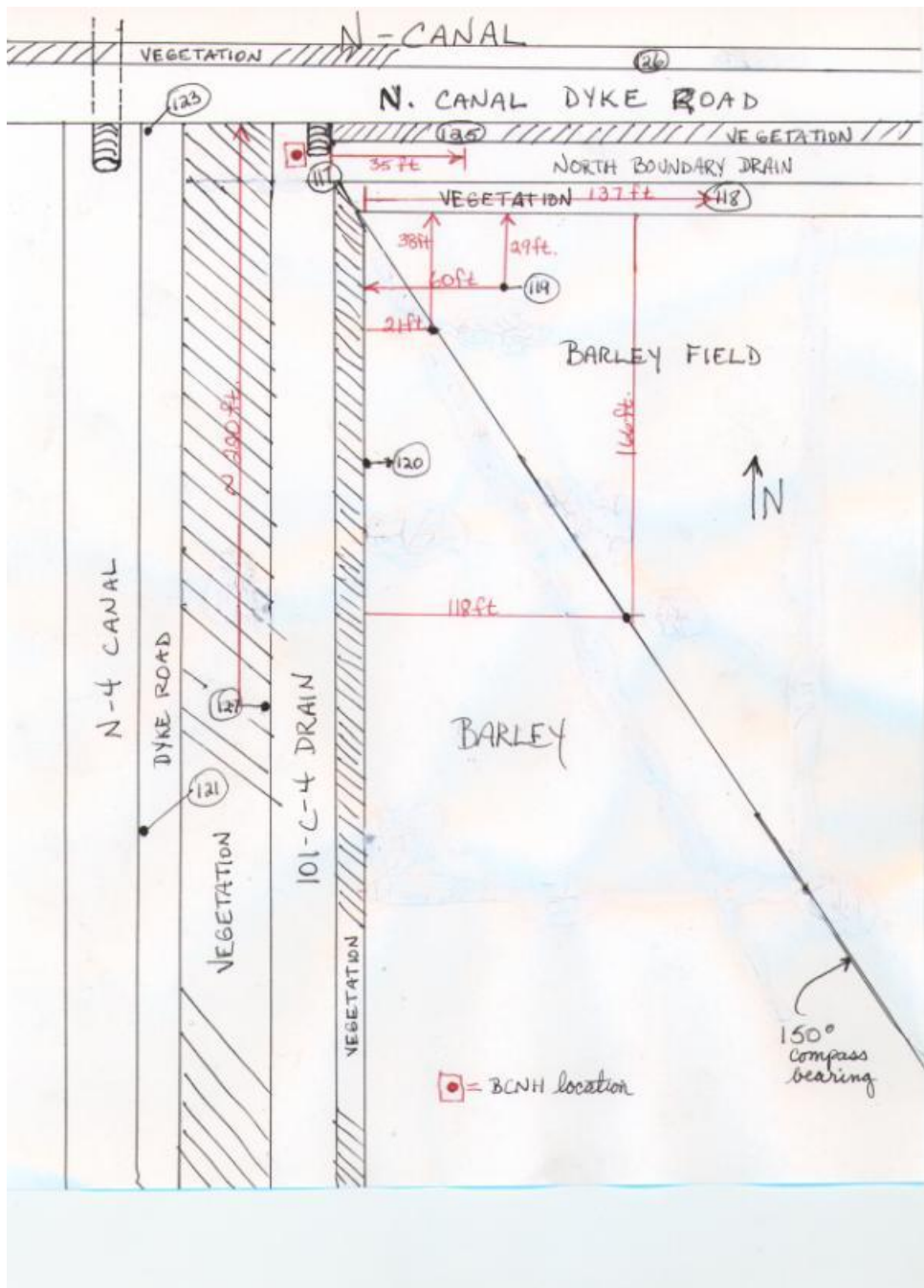


Figure 1. Vegetation Sampling Locations